Buyers' Guide: Soldering/ Desoldering Stations

Market Survey: Defence Electronics

What's New in RF Testing

₹ 100

SEPTEMBER 2015

electronics FOR YOU PLUS

SOUTH ASIA'S MOST POPULAR ELECTRONICS MAGAZINE

TOP 5 DO-IT-YOURSELF

- Faraday's Guitar
- Lift Indication Using Raspi
- Thermocouple Tutorial Using Arduino
- Bed-Vacancy Alarm System
- Analogue Clock Using MATLAB

Plus, many more make-your-own projects inside

THE INTERNET OF MEDICAL ELECTRONICS

An EFYGROUP Publication
Vol. 04 No. 05
ISSN 2454-4426
Pages: 164+8 | UK £5; US $10

Get to the problem before the problem gets to you.

Confidently detect problems with 4 times better resolution.

Get to the heat of the problem fast with Keysight True/*R* Thermal Imagers. Avoid an unplanned shutdown **with this lightweight, easy-to-use handheld device. With the in-camera fine resolution of 320X240 pixels** you'll spot issues quickly, clearly and as close as 10 cm away. That's 4 times better than competitors and at no added cost. You can't afford a factory shutdown, but you can afford the Keysight True/*R* Thermal Imager.

	U5855A	U5856A	U5857A
Detector resolution	160 x 120 (19,200 pixels)		
In-camera fine resolution	320 x 240 (76,800 pixels)		
Temperature measurement range	–20 °C to +350 °C	–20 °C to +650 °C	–20 °C to +1200 °C
Spatial resolution (IFOV)	3.1 mrad (2.1 mrad with fine resolution)		
Sensitivity	0.07 °C at 30 °C		

Limited time only: FREE 5 year warranty
www.keysight.com/find/True/Rimager

For more information: Call: 1800 11 2626 (toll free), (0124) 229 2010 or email: tm_india@keysight.com, website : www.keysight.com

KEYSIGHT TECHNOLOGIES
Unlocking Measurement Insights

ECN 2015 WINNER iMPACT Awards
Cooling and Thermal Management
U5855A TrueIR Thermal Imager

Agilent's Electronic Measurement Group is now **Keysight Technologies**.

The World's Largest Selection of Electronic Components Available for Immediate Shipment!™

We Source What's Inside YOUR DESIGN

US $40 SET RATE
SHIPPING TO INDIA*

Digi-Key ELECTRONICS

000-800-100-1274
DIGIKEY.IN

1,000,000+ PRODUCTS IN STOCK | 650+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

*Orders can be shipped via Federal Express, UPS, or DHL for delivery within 3-4 days (dependent on final destination). If excessive weight or unique circumstances require deviation from this charge, customers will be contacted prior to shipping order. Digi-Key is an authorized distributor for all supplier partners. New products added daily.

ecia MEMBER ecsn CEDA

contents

ELECTRONICS FOR YOU PLUS | SEPTEMBER 2015 | VOL. 04 NO. 05 | ISSN-2454-4426

TECH FOCUS

BUYERS' GUIDE

DO-IT-YOURSELF

EFY Plus DVD

NEXT ISSUE

- Robotics & Automation (Smart Machines)
- Solar Electronics
- Latest Tools to Manage ESD for Your Lab

EDITOR : Ramesh Chopra

EDITORIAL CORRESPONDENCE : Editorial Secretary
Phone: 011-26810601; E-mail: editsec@efy.in
(Technical queries: efylab@efy.in)

SUBSCRIPTIONS & MISSING ISSUES : Phone: 011-26810601 or 02 or 03
E-mail: support@efy.in

BACK ISSUES, BOOKS, CDs, PCBs etc. : Kits'n'Spares, New Delhi
Phone: 011-26371661, 26371662
E-mail: info@kitsnspares.com

EXCLUSIVE NEWSSTAND DISTRIBUTOR : IBH Books & Magazines Distributors Ltd
Unit No.10, Bezzola Complex,
Opp. Suman Nagar, Sion Trombay Road,
Chembur, Mumbai 400 071
Phone: 022-40497401/02

ADVERTISEMENTS

NEW DELHI (HEAD OFFICE) : Ph: 011-26810601 or 02 or 03
E-mail: efyenq@efy.in

MUMBAI : Ph: 022-24950047, 24928520
E-mail: efymum@efy.in

BENGALURU : Ph: 080-25260394, 25260023
E-mail: efyblr@efy.in

CHENNAI : Ph: 044-42994363
E-mail: efyenq@efy.in

HYDERABAD : Ph: 040-67172633
E-mail: efyenq@efy.in

KOLKATA : Ph: 033-22294788
E-mail: efyenq@efy.in

PUNE : Ph: 08800295610, 09870682995
E-mail: efypune@efy.in

GUJARAT: : Ph: 079-61344948
E-mail: efyahd@efy.in

CHINA : Power Pioneer Group Inc.
Ph: (86 755) 83729797, (86) 13923802595
E-mail: powerpioneer@efy.in

JAPAN : Tandem Inc., Ph: 81-3-3541-4166
E-mail: tandem@efy.in

SINGAPORE : Publicitas Singapore Pte Ltd
Ph: +65-6836 2272
E-mail: publicitas@efy.in

TAIWAN : J.K. Media, Ph: 886-2-87726780 ext. 10
E-mail: jkmedia@efy.in

UNITED STATES : E & Tech Media
Ph: +1 860 536 6677
E-mail: veroniquelamarque@gmail.com

SUBSCRIPTION RATES

Period	Newstand Price (₹)	You Pay (₹)	Digital (₹)	Overseas	
Year				Digital	Print
Two	2400	1800	750	US$ 15	—
One	1200	960	280	US$ 5	US$ 120

Please send payments only in favour of **EFY Enterprises Pvt Ltd**

Regulars

Keysight Technologies
Ultimate Scope Program

Get up to 17 FREE software applications with your purchase of a Keysight 2000 X-, 3000X-, 3000T X-, 4000 X-, or 6000 X-Series oscilloscope

Available June 1 – November 30, 2015

UP TO $23k IN SAVINGS!

- Arbitrary Wave Gen
- Digital Voltmeter and Counter
- Mask Limit Testing
- Trigger and Decode:
  - I^2C I^2S
  - SPI
  - LIN/CAN/-DBC/-FD
  - SENT
  - RS232/UART
  - ARINC 429
  - MIL-STD 1553
  - USB 2.0
- Education Training Kit
- Video/TV application
- And More...

Application software on your oscilloscope improves your ability to debug your system by turning data into insight. For a limited time, receive one free application bundle with the purchase of any InfiniiVision 2000 X-, 3000 X-, 3000T X-, 4000 X-, or 6000 X-Series oscilloscope. This gives you up to 17 applications (including a free integrated function/arbitrary waveform generator and DVM) at no additional cost! Take advantage of this program while it lasts and receive the Ultimate Scope.

Our Network:

Andhra Pradesh : Synergy Measurement Technologies Pvt. Ltd., 040 44444040 vincent@synergytech.in, **(RCI-DRDO)** Sai Microsystems Pvt. Ltd., 09849171355 sales@Saimicro.com ; **Vishakhaptnam :** RKe Technologies, 08912793176 prakash@rketech.com ; **Chhattisgarh, Gujarat & Madhya Pradesh :** Automation System Engineers Pvt. Ltd., 07926467827 shaunak@asepl.in ; **East & North East India :** Elmax Projects & Services, 033 24174322 debashis@elmaxprojects.in ; **Karnataka :** Applied Real Tech Systems Pvt. Ltd., 080 23506121 arvind@arts.net.in ; **Kerala :** Innovative Instruments Inc., 0471 2316385 babu@innovativeinc.in ; **Maharashtra :** Synergy Measurement Technologies Pvt. Ltd., 020 25468459 wamanjogs@gmail.com ; **North India :** Agmatel India Pvt. Ltd., 011 43064306 marketing@agmatel.com ; **Tamil Nadu :** Elmack Engg Services, 044 26540919 swami@elmackengg.com ; **Western India (Naval Accounts):** Shubh Enterprises, 022 22844954 pallav@shubhent.com

For more information: Call: 1800 11 2626 (toll free), (0124) 229 2010 or email: tm_india@keysight.com

KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Agilent's Electronic Measurement Group has become **Keysight Technologies**.

FEEDBACK

Article on Robotic Submarine

Please publish some articles on underwater submarine seabed surface using robots. I hope EFY is aware of the loss of our Indian coast guard, Dornier CG-791, near Tamil Nadu sea coast.

Prakash Raamaseshan
Ministry of Home Affairs
Government of India.

EFY: Thanks for the feedback! We will try to carry something on the mentioned subject if a suitable article is received from our contributors.

Solar Based Article

It would be helpful if you could start a series on solar panels and batteries required in solar cars or cycles. There are rumours on the Internet about solar power generation using static charges on Earth. Please help clear such myths.

John Tarun,
Through email

EFY: Thanks for writing to us and sharing your thoughts. Regarding the myths related to solar power generation using static charge of Earth, allow us to review the same. We do keep publishing articles related to the latest in solar technologies in *Electronics For You*. We will try and publish more.

IoT Course

I just completed my B.Tech and would like to learn and make IoT devices. Let me know if you have any training centre or workshop that provides training on the same.

Saurabh Jha
Through email

EFY: We have training centres in various parts of India for short-term courses on subjects such as Basics of Electronics, PCB design, PIC microcontrollers, VLSI design, Raspberry Pi, Arduino and Robotics.

Soon, we will be starting a training course on Internet of Things (IoT) and some other subjects as well. For details please log on to *www.efytechcenter.com*

'Spot An Error' Award Winners

In Design section, in 'Basic User Interface Design for Electronics Engineers' article of July issue, in Fig. 5, the resistance (minimum) and key width (maximum) are wrong. It should be force (minimum) and force (maximum) because Newton (N) is the unit of force.

Ramakanta Mohanta

❏ In 'Arduino Based Gesture-Controlled Robot' DIY article published in July issue, a 16×2 LCD is mentioned in Parts List by mistake.

Ishan Shah

❏ 1. In 'Electronic Door Lock Using Arduino' article, columns C1, C2, C3 and C4 are mentioned as capacitors and rows R1, R2, R3 and R4 as resistors.

2. In 'Low-Frequency Electronic Muscle Stimulator' circuit in July issue, ratings for transformers X1 and X2 are wrong. Current ratings should be less than 100mA for X2.

Vijay Kakul

Errata

In the Buyers' Guide on 'Pocket-Friendly Oscilloscopes under ₹ 50,000' in July issue, the price of Tektronix TBS1022 is wrongly listed as ₹ 39,555. The price of the product is ₹ 21,865.

Wireless Gesture-Controlled Robot

I am using GY-61 ADXL335 accelerometer sensor in 'Wireless Gesture-Controlled Robot' DIY article published in January issue. Will the code given in the article work with this sensor?

Shripal Jain
Through email

❏ I am using Arduino UNO in the mentioned project. How can I make the robot work?

Raj R.
Through email

The author Aquib Javed Khan replies: Mr Jain should not forget to connect AREF pin with 3.3 volt. He should check the code and the respective connections. He may download the source code from *source.efymag.com*

It is simple to work with Arduino UNO board. One needs to just upload the code on Arduino, connect the circuit as shown in the article. Note that pins 16, 17, 18 and 19 may have different functions and values on Arduino board. For example, pins 16, 17, 18 and 19 of ATmega328 are digital pins 10, 11, 12 and 13, respectively, on Arduino board.

Ultrasonic Radar

Please provide more details on the ultrasonic sensor used in 'Ultrasonic Radar Model Using Microcontroller ATmega128' DIY article published in February issue.

You have mentioned that the UDM sensor module has four pins but this module has only three pins for connection to the external circuit. Is there a readymade sensor available in the market?

Manu Shankar
Through email

The author Ashutosh M. Bhatt replies: A normal ultrasonic sensor has four pins, namely, Vcc, Gnd, Trig and Echo. In the given sensor, it is required to scan for received echo signal first; the distance is then calculated through the program.

There are three different types of ultrasonic sensors based on their output: normal, PWM and direct serial data. In this project, I have used the third one. It has three pins, namely, Vcc, Gnd and Serial data out, for interfacing. It is a smart 3-pin ultrasonic sensor.

EFY: A readymade 3-pin sensor is available; check at *www.sunrom.com/c/distance-ultrasonic*

Things You Wanted to Know!

Q1. I would like to know what MIFARE technology is, and what is the difference between MIFARE card and RFID card technologies? Also, how can I test pH values of water? Which pH sensor is easily available in the market for measuring pH values of water?

Pamarthi Kanakaraja,
assistant professor, Usha Ram College of Engineering and Technology, Andhra Pradesh

A1. Radio frequency identification (RFID) refers to small electronic devices that consist of a small chip and an antenna. An RFID device serves the same purpose as a barcode or magnetic strip on the back of a credit card or ATM card. It identifies the object on the basis of a unique identifier for that object. It is used for identification of objects or people and inventory management. An RFID card is usually used at homes and offices.

MIFARE technology is for smartcards. There are two criterion to define smartcards; one is the method of writing and reading card data and second is the type of chip implanted within the card and its capabilities. There are three types of cards: contact cards, contactless cards and multi-component cards.

Contact cards are the most common type of smartcards. These have contact area of approx. one square centimetre, comprising several gold-plated contact pads. These pads provide electrical connectivity when the card is inserted into a reader.

Contactless cards are proximity cards (these do not touch). These communicate with and are powered by the reader through RF induction. RFID cards, radio frequency integrated circuit (RFIC) cards and MIFARE cards are all contactless cards.

The MIFARE name is derived from the term Mikron FARE Collection System, which is the trademark of NXP Semiconductors. These employ an RFID between the card and reader and so do not require insertion of the card. Instead, the card is passed along the exterior of the reader and read.

A contactless smartchip based device includes an embedded secure microcontroller or equivalent intelligence, internal memory and a small antenna, and communicates with a reader through a contactless RF interface. The contactless interface provides users with the convenience of allowing the contactless device to be read at short distances with fast transfer of data. A MIFARE card has a much larger memory than an RFID card and is widely used in hotels as payment cards and for identification purposes.

MIFARE family available for smartcard solutions are MIFARE Classic, MIFARE Plus, MIFARE DESire and MIFARE Ultralight. These offer more than 40 different applications, some of which are limited-use tickets in public transport (single and multiple trip tickets, tourist weekend passes), event ticketing (stadiums, exhibitions, amusement parks), loyalty and closed-loop payment schemes, access management, employee cards, school cards, citizen cards and for car parking.

In brief, MIFARE technology, a trademark of NXP Semiconductors, is used for contactless smartcards and is RF-enabled. Whereas, RFID is also RF-enabled but is used for identification purposes.

The pH value of water can be measured using the following methods:

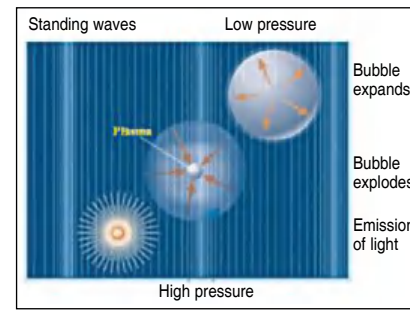
Using pH meter. The probe of the meter is dipped in water and the value is read from the display, which gives a direct reading of pH value.

Use of pH strips. pH strips contain a series of indicator bars that change colour after exposure to a solution. Strength of the acids and bases on each bar differs. After the bars change colour, it can be matched with the key that comes with the kit. For selecting a pH sensor, you may check out Sensorex; it is also available online.

Q2. What is bubble power? How is bubble power derived from sonofusion technology?

Satyajit Samal,
Bhubaneswar, Odisha

A2. Bubble power is a method of generating energy. It works under the principle of sonofusion, which is technically known as acoustic inertial confinement fusion. It is derived from a related phenomenon, sonoluminescence, where a source of sound, which is attached to a liquid-filled flask, sends pressure waves through the fluid, exciting the motion of tiny gas bubbles. The bubbles periodically grow and collapse due to extreme temperatures inside the bubble, producing visible flashes of light that last less than 50 picoseconds.



Bubble power

Chemical reactions occur during cavitations of a single, isolated bubble and yield photons, radicals and ions. That means, gas bubbles in a liquid can convert sound energy into light. For several years the sonofusion research teams from various organisations have joined forces to create acoustic fusion (AFTEC) to promote the development of sonofusion. Sonofusion may one day become a revolutionary new source of energy.

Answers compiled by EFY joint director (training), Col. N.C. Pande (Retd). Letters and questions for publication may be addressed to Editor, Electronics For You, D-87/1, Okhla Industrial Area, Phase 1, New Delhi 110020 (e-mail: editsec@efy.in) and should include name and address of the sender

www.indiaelectronicsweek.com

INDIA ELECTRONICS WEEK

January 11th-13th, 2016 • Bengaluru

An EFY GROUP EVENT

6 Electronics Events. Together.

Electronics ForYou expo | electronics Rocks | TEST & Measurement India

LEDASIA.in | iotshow.in | raksha India

January 11th-13th, 2016 • Bengaluru

For more information, talk to us at +91-11-40596605 or email at growmybiz@efy.in

International Partners

Partner Associations

Media Partners

Tutorials for Electronics

Learning can be fun if you have the right resources for it. This month we have for you some websites that could get you interested in electronics

NIRAJ SAHAY

electronics-tutorials.ws

This all-new website on basic electronics tutorials is one place to begin learning about electronics. The purpose of this site is to give students and beginners good basic electronics tutorials and information to help develop their knowledge and understanding of the subject. It has tutorials varying from learning colour coding for resistors to understanding digital electronics. Each tutorial has an option to post replies and comments to discuss; however, a forum is missing.

www.electronics-tutorials.ws

williamson-labs.com

This website features a vast collection of tutorials on electronics, from basic to university level; more than 400 URLs, in over 90 related subject areas. It presents all the theory in the form of animations and 3D pictures, helping you to understand and imagine electronics better. For details, contact *webmaster@williamson-labs.com*

www.williamson-labs.com

learn.sparkfun.com

SparkFun is an online retail store that sells bits and pieces to make your electronics projects possible. In addition to products, it also offers classes and online tutorials to help educate individuals on the wonderful world of embedded electronics. The tutorial section has more than 330 tutorials on different topics.

www.learn.sparkfun.com/tutorials

learn.adafruit.com

Learn how to use Arduino to blink an LED, control a motor, play sounds, hook up an LCD display and much more at Adafruit. Adafruit was founded in 2005 by MIT engineer, Limor "Ladyada" Fried. Her goal was to create the best online space for learning electronics and making the best designed products for makers of all ages and skill levels. The company has grown to over 50 employees in the heart of New York City, New York, USA, with a 1400+sqm (15,000+ square feet) factory. The website gets updated daily and is capable of giving a complete learning experience to all.

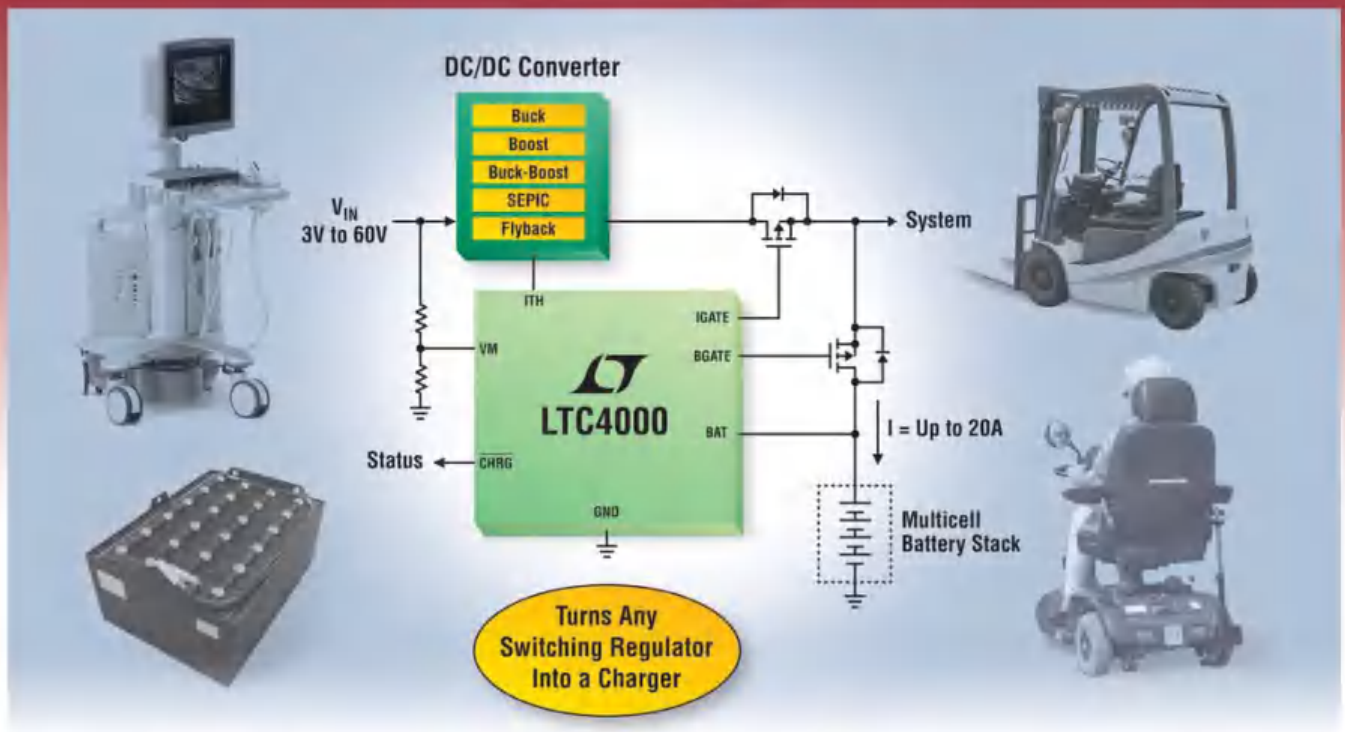
www.learn.adafruit.com

hobbyprojects.com

Hobby Projects is a collection of links to thousands of electronic circuits, schematics, online tutorials and much more, where you can find quick solutions for solving your electronics design problems. New circuits, tutorials or links to useful circuits are added regularly as a resource for school and college students, beginners, hobbyists, engineers, inventors and consultants. The site has tutorials ranging from beginner to advance levels.

www.hobbyprojects.com/aboutus.html

New Concept in BIG Battery Charging



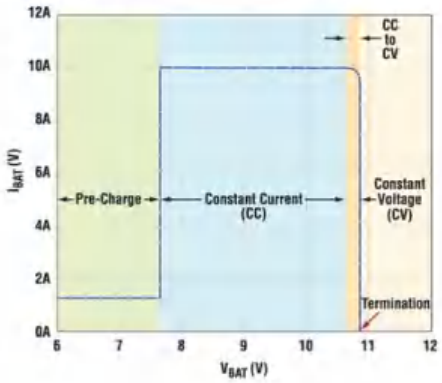
Complete Solution: PowerPath™ Control & Termination with No Software

The LTC®4000 is a high voltage controller and power manager which, when paired with a DC/DC converter, becomes a full-featured battery charger solution. The LTC4000 is capable of driving virtually any topology, including buck, boost, buck-boost, SEPIC and flyback converters. Its intelligent PowerPath manager provides power to the system load when input power is available, enabling instant-on operation even with a deeply discharged battery. A full-featured controller, the LTC4000 can charge a variety of battery types including lithium, nickel and lead acid-based chemistries. Highly accurate charge current and float voltage, as well as on-board termination, ensure safe and accurate charging.

Features

- Input/Output Voltage: 3V to 60V
- Charge Currents up to 20A
- Input Ideal Diode for Low Loss Reverse Blocking and Load Sharing
- Programmable Input and Charge Current: ±1% Accuracy
- ±0.2% Accurate Programmable Float Voltage
- Programmable C/X or Timer-Based Charge Termination
- NTC Input for Temperature Qualified Charging

Charge Current Profile vs V_{BAT}



V_{FLOAT} = 10.8V

Info & Free Samples

www.linear.com/product/LTC4000

1-800-4-LINEAR

Free Battery Charger Solutions Brochure

www.linear.com/batsolutions

Linear Technology
India Sales
602, 6th floor, Prestige Meridian-1, No. 29, MG Road, Bangalore 560001, India Tel: (91) 80 4012 4610, Fax: (91) 80 4012 4612.
Mail Id: indiasales@linear.com

LINEAR TECHNOLOGY

Arrow Electronics
Head Office - Bangalore
Fortune Summit, Ward No.174, 6th Sector HSR Layout, Roopena Agrahara, Bangalore ñ 560 068, India. Tel: (91) 80 4135 3800, Fax: (91) 80 4112 7784 Mail Id: sales.india@arrowasia.com
Branches: • Chennai • Hyderabad • Mumbai • Pune • New Delhi

TECHNOLOGY AT YOUR SERVICE

Ball-shaped camera to put 360° photography on the map

Ever since hardware entrepreneur Jonas Pfeil first started working on Panono camera, a ball-shaped device that captures photo spheres, back in 2011, the field of 360° imagery has exploded.

The Panono has a diameter of 11cm and weighs approximately 480gm

The Panono captures photos when thrown upwards, taking the shot at the moment it reaches its highest point. The 360° images it captures are technically 108MP, stitched together from the array of 3MP lenses that dot the exterior of the ball.

The camera is about the size of a grapefruit and feels just as heavy. The plastic exterior is sprinkled with small, slightly indented lenses, and it has a rubberised green trim, which provides a better grip. On one of the ball's poles there is an LED and a trigger button; on the other is a cap that covers the micro-USB port and connector for a removable handle. The handle is for situations when you do not want to throw the camera; simply attach it and click the button on the grip.

Electronic skin sensors to control mobile gadgets

A skin-worn sensor that turns the human body into a touch-sensitive surface for controlling mobile devices has been developed by scientists in Germany. Named iSkin, the sensor is made from bio-compatible silicone rubber with pressure-sensitive sensors that are stuck to the skin of the users, allowing them to use their own body to control mobile devices.

iSkin by Max Planck Institute

Developed by scientists at Max Planck Institute for Informatics and Saarland University, the experimental system has been produced in different shapes and sizes to suit various locations on the body, such as the finger, forearm or behind the ear-lobe. It is capable of detecting touch input pressure even while being stretched or bent. With the current prototypes, wearers can answer incoming calls, play music and adjust volume.

The base material is poly-dimethyl-siloxane (PDMS), an easy-to-process silicone based organic polymer. Conductive carbon black powder is added to the liquid silicone before it is spread flat by a thin-film applicator. After creating the tattoo-like designs on a computer, a laser cutter traces out the design, which makes up the sensor. It is then sandwiched between two clear sheets of silicone. The stickers are attached to the body using a medical-grade adhesive that can be easily peeled off after use, without hurting the skin.

Insect-sized robot can jump on water

Researchers from Harvard University have built an insect-sized robot that mimics the way water striders jump on water. By observing water striders using high-speed cameras, scientists noticed that insects do not simply push down on the water but gradually accelerate their legs so as to not break surface tension. Striders also sweep their legs inwards before each jump, to maximise the amount of time they touch the surface, which increases the force of their pushes.

The researchers used these principles to develop an ultra-lightweight robot with a 2cm-long body inspired by origami. Its 5cm-long wire legs are curved at the tips like a real water strider's and coated with a material that repels water.

A flea-inspired jumping system, called a torque reversal catapult, launches the robot from the surface of the water up to 14.2cm in the air.

electronica India 2015 productronica India 2015

Visit us at Hall 10 / Booth 1020 9-11th September 2015, New Delhi, Pragati Maidan

In electro-chemical solutions, we reign

In the formulation, manufacture and supply of conformal coatings, thermal pastes, encapsulants, cleaners and lubricants, we have the solution. Through collaboration and research, we're developing new, environmentally friendly products for many of the world's best known industrial and domestic manufacturers – always to ISO standards.

Combine this unique ability to offer the complete solution with our global presence and you have a more reliable supply chain and a security of scale that ensures you receive an exemplary service.

Maintenance & Service Aids

A total solution for maintenance, repair and overhaul

ELECTROLUBE
THE SOLUTIONS PEOPLE

A wide range of maintenance products to complement the major product groups are available. Whether used by OEMs or subcontractors, these products are supplied in convenient packaging, covering a wide range of applications and requirements. Electrolube has the solution.

- Airduster and freezer sprays
- Cleaners and wipes
- Greases and oils
- Encapsulation resins and conformal coatings
- Paints and galvanising sprays
- Maintenance, test, repair and small scale production
- Syringes, pump sprays, tubes, aerosols, wipes, pens

Isn't it time you discovered how Electrolube can serve you? Simply call, or visit our website.

+91-80-40407109
info@electrolube.in
www.electrolube.in

HK WENTWORTH (INDIA) PRIVATE LIMITED.
Private Office 109, DBS House, #26, Cunningham Road, Bangalore 560052, India

ELECTROLUBE
THE SOLUTIONS PEOPLE

A lamp that runs on a glass of water, salt

A Philippines based company has developed a lamp that can run for eight hours at a stretch on a glass of water and two tablespoons of salt. The Sustainable Alternative Lightning (SALt) lamp does not have any hazardous material or component and it has a USB port for charging a smartphone.

According to SALt website, "There are more than 7000 islands in Philippines and most of these do not have access to electricity. We want to eliminate the sustaining cost in areas that rely on kerosene/battery-powered lamps and candles as their main source of lighting."

The lamp uses the science behind the galvanic cell, the basis for battery-making, changing the electrolytes to a non-toxic, saline solution, hence making the entire process safe and harmless.

When electrodes are placed in the electrolyte, the energy generated kicks an LED light into gear. Moreover, the salinity of ocean water can operate the lamp.

Stronger, tougher paper could lead to flexible electronics

Cellulose fibres can be used to make tougher and stronger paper that may pave the way for flexible electronics such as paper smartphones, printable solar cells and green vehicles.

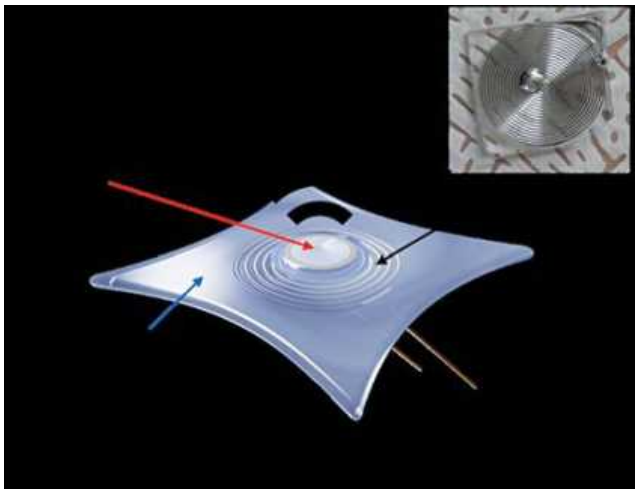
Researchers at University of Maryland, USA, have discovered that paper made of cellulose fibres is tougher and stronger the smaller the fibres get. They explored the mechanical properties of cellulose, the most abundant renewable bio-resource on Earth, and made papers with several sizes of cellulose fibres, ranging in size from 30mm to 10nm.

The paper made of 10-nanometre-thick fibres was 40 times tougher and 130 times stronger than regular notebook paper, which is made of cellulose fibres a thousand times larger.

Bendy liquid metal coils for making stretchable loudspeakers

Coils of liquid metal could be used to make stretchable loudspeakers and microphones, potentially leading to new kinds of hearing aids, heart monitors, and wearable and implantable devices.

Acoustic devices often rely on rigid metal coils that can both emit and detect sound. Scientists in Korea have created a stretchable acoustic device by replacing this rigid coil with a deformable, liquid metal coil. This new coil is made of Galinstan, a highly conductive liquid metal alloy of gallium, indium and tin. They used a syringe to inject Galinstan into a spiral channel in a thin film of flexible silicone rubber. They then attached copper wires to the end of the coil and a neodymium magnet (made from an alloy of neodymium, iron and boron) to the centre of the coil.



Bendy liquid metal coils could help create stretchable loudspeakers

They operated the device by electrically charging the liquid metal coil, turning it into an electromagnet that could push back and forth off the neodymium magnet to either detect or emit sound. They were able to record sounds, such as the human voice and a beeping alarm clock, and play these back while the device was attached to the wrist or was being stretched by hand.

Researchers found the device can be stretched up to 50 percent its length, 2000 times without any noticeable loss of acoustic performance. It could also play back sounds across the frequency range of human hearing.

Wood based computer chips could help with electronic waste crisis

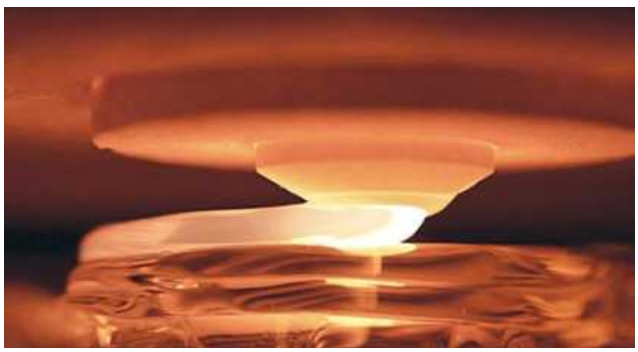
Wood based computer chips are a reality, and these could make the recycling of electronics a much simpler task. Developed at University of Wisconsin, USA, by a group led by engineering professor Zhenqiang (Jack) Ma, the wood-derived computer chip is made by processing wood into nanocellulose paper, which is then used as a substitute for silicon.

Unlike the rigid silicon wafer that serves as a plate for transistors in most computer chips, Ma's chip uses a translucent, bendable plate made of highly processed wood. According to a piece in the MIT Technology Review, using nanocellulose in lieu of conventional silicon requires just a tiny fraction of the semiconducting material otherwise needed in the process, and does not sacrifice performance.

In two demonstrations, Ma and his colleagues showed they could use nanocellulose as the support layer for radio frequency circuits that perform comparably to those commonly used in smartphones and tablets. They also showed that these chips could be broken down by a common fungus.

MIT unveils 3D printing of glass objects

The field of 3D printing is still largely the domain of major companies in need of easier prototyping methods and hobbyists. But a new breakthrough could vastly expand the technology's applications, that is, 3D printed glass.



3D printing of glass

MIT has unveiled a method it calls G3DP that allows the creation of complex 3D glass structures to be printed in a similar fashion to plastic constructs.

MIT's process accomplishes this by using two chambers, one that acts as a kiln cartridge and another that works to melt the structures together. The molten glass is distributed through an alumina-zircon-silica nozzle that pours the material out like soft-serve ice cream.

The G3DP process was developed by a team including MIT Media Lab's Mediated Matter group, MIT Glass Lab, Wyss Institute and MIT's Mechanical Engineering Department.

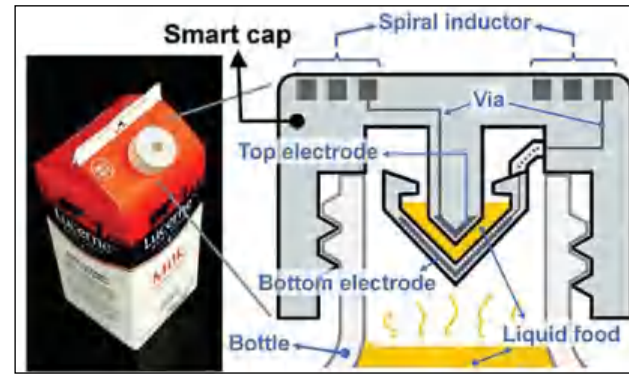
One of the project's researchers, Neri Oxman, says that this could also lead to advances in creating fibre-optic cables that transmit data more efficiently.

3D-printed smartcap to sense spoilt food

UC Berkeley (USA) engineers, in collaboration with colleagues at Taiwan's National Chiao Tung University, are expanding the already impressive portfolio of 3D printing technology to include electrical components. They have put the new technology to test by printing a wireless smartcap for a milk carton that can detect signs of spoilage using embedded sensors.

Polymers and other such materials are poor conductors of electricity, and thus bad candidates for electronic devices. To get around this, the researchers started off by building a system using polymers and wax. They then removed the wax, leaving hollow tubes into which liquid metal—in their experiments they used silver—was injected and then cured.

Researchers integrated the electronic components into a plastic milk carton cap to monitor signs of spoilage. The smartcap was fitted with a capacitor and an inductor to form a resonant circuit. A quick flip of the carton



UC Berkeley engineers created a smartcap using 3D-printed plastic with embedded electronics to wirelessly monitor the freshness of milk (Photo and schematic by Sung-Yueh Wu)

allowed a bit of milk to get trapped in the cap's capacitor gap, and the entire carton was then left unopened at room temperature for 36 hours.

The circuit could detect the changes in electrical signals that accompany increased levels of bacteria. The researchers periodically monitored the changes with a wireless radio-frequency probe at the start of the experiment and every 12 hours thereafter, up to 36 hours.

Facebook's solar-powered drone to beam Internet from the sky

Facebook has completed the production of its first full-scale solar-powered Internet drone that will deliver wireless Internet with lasers from the sky in parts of the developing world where there is a lack of connectivity.

Facebook's solar-powered drone to beam Internet from the sky

Mark Zuckerberg, co-founder, Facebook, has announced the completion of Aquila, Facebook's first unmanned plane that beams down Internet connectivity from the sky, as part of his project with *Internet.org*.

Aquila's wings are made of carbon fibre. It has the wingspan of a Boeing 737, but weighs less than a car and can stay in the air for months at a time.

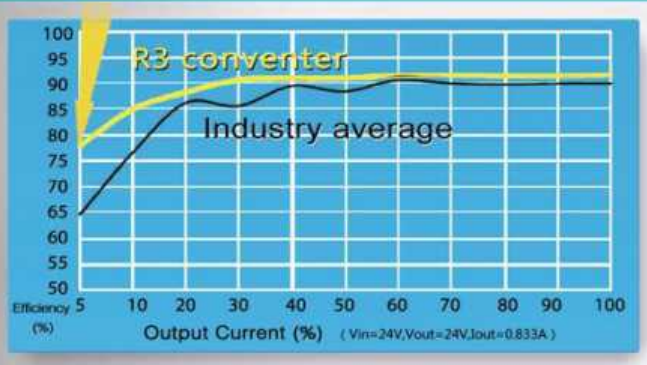
Facebook will have lasers on the ground that can locate the dome-shaped optical head, located on the bottom of the plane, in the air, basically shooting a laser at a dime-sized target that is more than 16km (10-miles) away. The plane will first hone in on the general location of the laser on the ground, proceeding to target it further and lock onto the location so that it can start beaming down the Internet.

SAVE ENERGY
IN YOUR POWER SYSTEM

with MORNSUN R3 DC-DC Converter

Stand-by power consumption low to 0.12W

Light-load efficiency exceeds 78%



MORNSUN®

info@mornsun.cn
www.mornsun-power.com

electronica India productronica India

New Delhi, Sept. 9–11, 2015
Booth: 9006, Hall 9

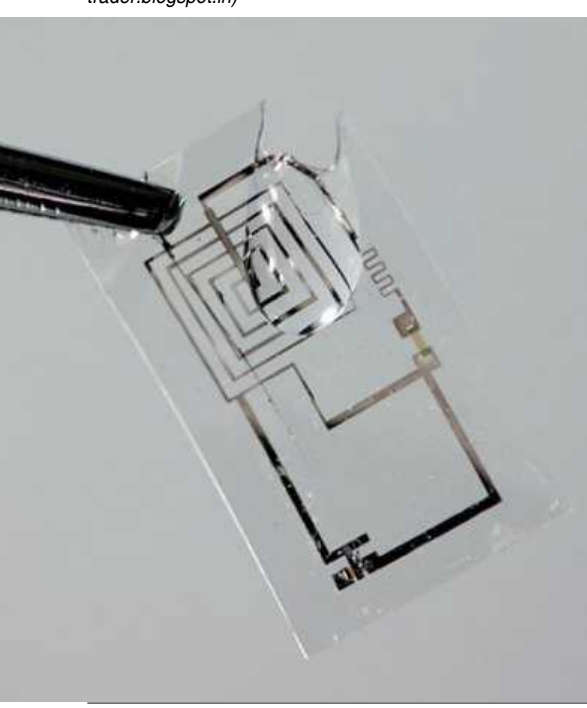
Transient Electronics That Disappear

Dr S.S. Verma is a professor at Department of Physics, Sant Longowal Institute of Engineering and Technology, Sangrur, Punjab

In this era of electronics-driven lifestyle with well-established advantages of durable, long-lasting electronics, and when the use of electronic devices has invaded into the human body itself, thinking about transient electronics (that dissolve after some time without leaving a trace) and its applications is inevitable.

Millions of patients have benefited from the innovative development of electronic medical devices/gadgets such as pacemakers or medicine-dispensing agents implanted in the body for either diagnostic or therapeutic benefits. While these have revolutionised modern medicine, many a time these outlive their purpose in the human body and require surgical removal to avoid complication. However, rather than removing these devices through surgery, what if these could simply disappear?

This is the concept behind transient electronics, the newly-developed electronic devices that are designed to dissolve inside the body once these have served their purpose. Transient electronics offer robust performance, which is comparable to current devices, but these completely resorb into their environment at a prescribed time, ranging from minutes to years, depending on the application.



A transient electronic device (Image courtesy: rational-trader.blogspot.in)

The goal of the electronics industry has been to build durable devices that last long with stable performance, but many new opportunities open up once we start thinking about electronics that could disappear in a controlled and programmable way. It is the new way of looking at electronics. Scientists and engineers are developing transient materials, which are special degradable polymer composite materials designed to quickly and completely melt away when a trigger is activated.

The technology could be useful for any application in which sensitive data is used. Some of these are military electronics equipment, credit cards and passports, and any application in which the electronic device is to be used for a defined period of time such as in bioelectronics, implantable electronics and environmental monitoring applications.

Development status

Previous research in the area has explored the use of transient materials to create dissolvable devices such as transistors, resistors and diodes. Researchers have also developed and tested transient resistors and capacitors.

The goal of research is to investigate how the rate of transiency could actually be controlled. They are experimenting with a blend of programmable biodegradable and transient insulating polymer films. They have found that by adding gelatin to the mix, dissolution can be slowed, while addition of sucrose speeds up the rate of transiency.

Using these special polymers, researchers were able to build and test an antenna that was capable of sending data and then completely dissolving itself when a trigger was activated. One constant in this experimentation with different composite structures is that the material maintains appropriate physical properties to function as a substrate for electronics.

The researchers are pioneers in the engineering of ultra-thin flexible electronic components. Only a few tens of nanometres thick, these tiny circuits, from transistors to interconnects, readily dissolve in a small amount of water or body fluid, and are harmlessly resorbed or assimilated.

Controlled degradation and transiency of materials is of significant importance in the design and fabrication of degradable and transient biomedical and electronic de-

www.nuvoton.com

nuvoTon

Nuvoton NuMicro™ Cortex™- M0 & M4 MCUs

Comprehensively enrich your daily life!

Asia's 1st & No-1 Cortex™-M0 MCU supplier with more than 100 Million units shipped

- The pioneer to launch Asia's first Cortex™-M0 & M4 MCUs based on 20 years of accumulated MCU experience
- Superior low power 32 bit MCU supplier for IoT, Medical Electronics & other key markets
- Quick shift to NuMicro™ – ***Simple*** to adopt, ***easy*** to migrate from conventional 8/16 bit, refer to http://www.nuvoton.com/support/tool-and-software/

★ **Nuvoton Technology India Pvt Ltd.** India@nuvoton.com | +91-80-4188 0660

★ **Distributors**

Arrow Electronics	Millennium Semiconductors	Omniscient Electronics	OS Electronics	Ramakrishna Electro
a.niyas@arrowasia.com	kunal@millenniumsemi.com	deshikan@omnisciententelectronics.com	amrendra@os-electronics.co.jp	sanjeev@rkelectro.com
+91- 8041353845	+91- 9922295311	+91- 9845022114	+91- 9971402598	+91- 9899797034

vices and platforms. Here, synthesis of programmable biodegradable and transient insulating polymer films is reported, which have sufficient physical and chemical properties to be used as substrates for the construction of transient electronics. The composite structure can be used as a means to control the dissolution and transiency rate of the polymer composite film.

The electronics are enclosed in a material that dissolves completely after a certain period of time when exposed to water or body fluids, somewhat like dissolvable sutures. By altering the number of layers of the wrapping, scientists can define how long the device will take to dissolve in the body or in the environment, including its overall lifetime.

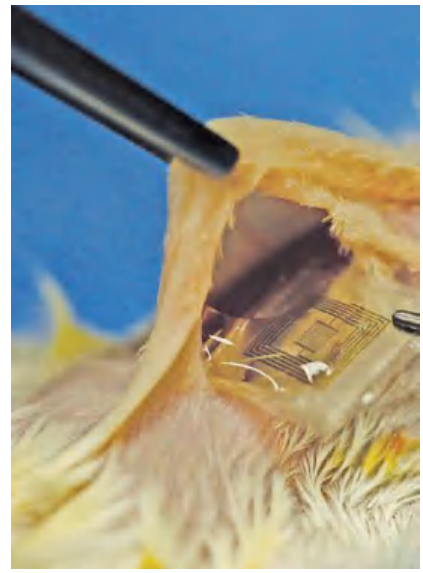
The devices perform just as well as conventional electronics and function normally until the encapsulating layer disappears. Once that happens, it only takes a few minutes for the electronic connections to dissolve away, and the device stops working.

Scientists have also reported progress in making the devices with conventional manufacturing processes instead of meticulously building one-by-one by hand in a laboratory. It is a step towards producing these devices with the kind of manufacturing processes that are already in wide use for traditional electronics like silicon based microprocessors and memory technology.

Another advancement involved the materials for making and powering the devices without an external electricity source. For example, latest transient electronic devices incorporate zinc-oxide, which is piezoelectric. This means that thin, flexible devices made with zinc-oxide could produce electricity when bent or twisted, perhaps by movement of muscles in the body, pulsation of blood vessels or beating of the heart.

Applications

Medical implants that are only needed for a few weeks could just disappear, without requiring any extra surgery to remove these from the body. And no one would have to retrieve dozens of transient water-quality sensors from a river undergoing water-quality monitoring. These would dissolve without a trace and without causing harm to the environment.



This electronic implant can dissolve inside the body (Image courtesy: rational-trader.blogspot.in)

Scientists have designed transient electronics as temperature sensors, solar cells and miniature digital cameras, for instance. Previous bioresorbable devices were made of different materials that only partially-dissolved, leaving behind residues, and did not perform as well as current devices.

Practical uses of a new genre of tiny, biocompatible electronic devices that could be implanted into the body to relieve pain or battle infection for a specific period of time and then dissolve harmlessly now seems possible. A medical device, once its job is done, could harmlessly melt away inside a person's body.

Researchers are now conducting further studies, centred on developing degradable polymer based materials that would make suitable platforms for other electronic components, including work on transient light emitting diode (LED) technology. They have produced a blue LED mounted on a polymer base with electrical leads embedded on it. When it comes into contact with just a drop of water, the base and leads begin to dissolve and the light goes out.

A lost credit card could vanish from existence (but would most likely still leave debt behind), a secret diary could be programmed to self-destruct should it be removed from its hiding spot and sensors stored with food could indicate when it has reached temperatures that would cause the food to spoil.

The real-world application for transient electronics with, perhaps, the most potential is in the field of military strategy, as similar research efforts from DARPA would indicate. If a soldier carrying sensitive information is captured, injured or worse, the electronics could be triggered to melt away before any classified information was gleaned by enemy forces.

A military device could collect and send data contained in it and then dissolve away, leaving no trace of an intelligence mission.

An environmental sensor could collect climate information and then wash away in the rain.

Electronic waste can also be controlled by designing integrated circuits out of materials that are biodegradable.

Dubbed transient electronics, the new class of silk-silicon devices promise a generation of medical implants that would never need surgical removal, as well as environmental monitors and consumer electronics that could become compost rather than trash.

In the future, researchers envision more complex devices that could be adjustable in real-time or are responsive to changes in their environment such as chemistry, light or pressure. Physicians and environmentalists alike could soon be using a new class of electronic devices that are small, robust and provide a high performance, yet are also biocompatible and capable of dissolving completely in water or in bodily fluids. ●

EVE
ENERGY VERY ENDURE

FOR YOUR INTELLIGENT LIFE

EVE IS DEDICATED TO PROVIDING CLEAN RENEWABLE ENERGY.

More than **300M** pcs cells have been supplied worldwide to the metering industry since 2001. As a global leading primary battery supplier, EVE is focused on the development of $Li/SOCl_2$, $Li\text{-}MnO_2$, $Li\text{-}FeS_2$, as well as super pulse capacitor(battery capacitor).

RoHS

EVE ENERGY CO., LTD.

Add : NO.36 HuiFeng 7 Roud,Zhangkai High Technology Development Zone,Huizhou, Guangdong,China
Tel : 0086-752-2606966
Fax : 0086-752-2601506
E-mail : sales@evebattery.com

Authorized Channel Partners in India

SM Electronic Technologies Pvt. Ltd.,
#1790, 5th Main, 9th Cross, RPC Layout,
Vijayanagar 2nd Stage, Bangalore - 560040
Contact Person: Mr. Rajiv Anand, Mob :+91-9810715377
Tel : + 91-80 23301030, Fax : + 91-80 23387197
E-mail : sales@mysmindia.com

PERFECT SOLUTIONS INC. 314, Krishna Mall,
Sector-12, Dwarka, New Delhi - 110075
Tel : +91-9213258888 Fax: +91- 45649530
web: www.psiindia.com
E-mail : sales@psiindia.com
sources2004@gmail.com

iBeacon! Beacon! What is it

Gautam Lakum works as a project coordinator - mobile apps, Multidots Solutions Pvt Ltd

iBeacon, introduced by Apple in 2013, is a technology that uses Bluetooth Low Energy (BLE) to broadcast and receive small amounts of information within short distances. It allows smartphones and other devices to perform some actions when these are within proximity to it. In short, someone can use iBeacon to tell nearby smartphones of its presence. It may not sound like much but you can make it quite interesting and useful with proper software and ideas.

How it works

A beacon is a broadcaster that always lets you know of its presence and how to identify it. For it to be useful, it requires a receiver (smartphone app) that can detect it and do whatever it needs to do based on how close it is from it. The beacon sends data all the time. When it is in advertisement mode, it sends data with three parameters, namely, a universally unique identifier (UUID), a major and a minor value.

Let us take the example of an exhibition that needs to set up beacon sensors and an app that can help and guide the visitors. The exhibition organisers could define a UUID that is unique to the beacons inside the exhibition area and their app. They can assign major and minor values according to the sections inside the exhibition area, like major value 0, minor value 1 near the entrance, minor value 2 near the drinks section.

Fig. 1: kontakt.io beacon

Fig. 2: Estimote beacon mounted on wall

The app receives the advertisement frame (data) broadcast by each beacon inside the exhibition area and, based on that, tells how close the smartphone is from each of these and takes required actions.

Fig. 3: Working of a beacon

The actions could be showing alerts, offering something and the like, for which it may need to contact the server using an application programming interface (API). Visitors who have installed the app would receive a welcome message at the entrance of the exhibition; if they are at drinks section, they would receive a voice message containing details about the next section, and so on.

If beacons are deployed at a store, customers would receive information regarding special offers. Similarly, if beacons are deployed in a museum, visitors would receive directions to its different sections.

What is BLE

BLE, which stands for Bluetooth Low Energy, is also known as Bluetooth Smart. It was introduced by Bluetooth Special Interest Group with an aim to build more energy-efficient applications in healthcare, fitness, home, beacons and security fields.

Most smartphones available these days are BLE-enabled. BLE is a mode that can be used to pair devices like beacons, smartwatches or wristbands. If a smartphone is BLE-enabled, it does not mean that it would use BLE every time it is paired. For example, if a Bluetooth headphone is paired, it would not use BLE to stream music, but if a smartwatch or wristband is paired, it would use BLE.

The main difference between classic Bluetooth and BLE is the energy required to transmit data between two devices. Because BLE is focused, it can transfer small amounts of data with slow speed as compared to Bluetooth. BLE cannot transfer data like audio/video as it is not supposed to work with applications that require high amounts of data transfer with high speed.

How stable are beacons

As beacons work on wireless technology, these can be unstable or imprecise when broadcasting data. Their stability depends on many factors like distance between beacon

It's not the survival of the fittest...
...It's the survival of the fastest.

LWI Electronics Inc.

We also buy OEM excess materials. Please send your offers.

- We have a network of world's top semiconductor distributors for mil, industrial and obsolete parts

Independent Distributor of Choice for your Semiconductor and IT Needs

- Your fast and reliable source of technical products/semiconductors of all reputed makes
- All sorts of ICs (mil grade, industrial/ obsolete parts), chips, transistor, diodes, resistors, capacitors, connectors and defence electronics components on ex-stock basis
- We have full range of AT&T paradyne modems and software networking products

Speed
Service
Quality
Reliability

LIVE WIRE Electronics

ISO 9001:2008 COMPANY

QUALITY 100% ASSURED

LWI Electronics Inc.
62, 14th Cross, I Block, R.T. Nagar, Bangalore 560032, India
Tel/Fax: +91-80-23530578, 23540578, 23633578, 23541578, 23541579
Branch Office Fax: +91-80-23539578
Cell: +91-9844048366, 9901499900, 9844003611, 9901199900
Email: sales@livewireinfo.com
www.livewireinfo.com

For jobs/career contact: hr@livewireinfo.com

Live Wire Group: World Sourcing

Where to buy

Beacons can vary in size based on their application. For example, if you want to place a beason inside a wristband, it should be tiny in size. But if you want to configure it in stores, it should be small and also match the store's theme. You can even get the beacons customised.

There are many vendors that sell beacons. Some of the well-known beacons are:

Roximity iBeacon. It does not require Internet and the battery lasts up to two years. There is no need to plug it in and you can place it anywhere. It provides location based triggers. You could buy it from *buyibeacons.com*

ONYX beacon. Its battery can last up to four years. You can place it anywhere regardless of power availability. You can also plug it in a USB port or power plug. It is available at *www.onyxbeacon.com*

GemTot. This beacon needs to be plugged into a USB port, so you do not have to worry about its battery life. You can buy it from *passkit.com/buy-ibeacon*

kontakt.io. Its battery lasts up to four years and you can manage it remotely. You can find it at *kontakt.io*

Estimote. This beacon is known for its style and looks. You can place it anywhere. It is also available in the form of stickers. You can buy it from *estimote.com*

and the receiver, battery status, obstacles and interference in signals, among others. It also depends on how fast the app is ranging the beacons. For example, Apple limits the scanning to one per second. So even when the beacons are configured to broadcast data at faster rates, the app will not be able to scan these at a rate higher than one second.

Developed apps using beacons

All smartphones and tablets that have Bluetooth 4.0+ (PLE-enabled) support beacons. There are various apps that can be developed using beacons.

For retail stores. Retail store owners can use beacons to advertise store offers. Customers who have installed the store's app on their device would receive details regarding various offers.

For tracking people. Beacons could be used to track persons/resources/workers. People can wear beacons on their wrists and when they move out of the area being tracked, the app could be configured to sound an alarm. These could also be used to track children and pets, and even Alzheimer patients.

For providing directions/details. Let us say, you are visiting a zoo and you have installed an app for the same. Once you enter, the app would give you directions to the different areas or sections within the zoo. If you are at the white tiger's cage, the app would display information about the animal.

Similarly, while visiting a museum, the app would give details about a painting that you are studying.

Automation. Imagine returning home after a long day and the door opening automatically. This type of automation is also possible using beacons. This can be implemented in houses, garages, industries and many other places.

sanwa®

ADVANCE TECH®

Since 1996
An ISO 9000:20008 Company

EXCHANGE OFFER
with any Meter & Get
20% OFF
on
SANWA JAPAN

Get **3 Years** Replacement Warranty*

- Multimeter Digital /Analog
- Clamp Meter
- Clamp Sensor
- Insulation Resistance Tester
- Hybrid Multimeter
- PC Link Multi Meter
- Lux Meter
- Optical Power Meter
- Laser Power Meter
- Tachometer
- Earth Tester
- Phase Detector
- LCR Meter

DISTRIBUTORS REQUIRED FROM ALL OVER INDIA

* Terms & conditions apply

PLEASE VISIT OUR WEBSITE FOR WIDE RANGE OF INDUSTRIAL SOLUTIONS

ADVANCE TECH SERVICES PVT. LTD.

(An ISO 9001: 2008 Certified Company)
PH: +91-11-47002024 upto 27 E-mail: info@advancetechonline.in
Web: www.advancetechonline.in

• NEW DELHI • BANGALORE • PUNE • HYDERABAD • CHENNAI

When Doctors Start Prescribing Electronics, What Would the Dosage Be

Janani Gopalakrishnan Vikram is a technically-qualified freelance writer, editor and hands-on mom based in Chennai

The way the term medical electronics is perceived by us has constantly evolved over time. At one time, it meant digital instruments to read one's blood pressure or glucose levels, or large, Internet-connected meters that could be used by doctors to test and treat patients in remote locations (with the help of trained technical staff) or implantable devices like cardiac pacemakers. However, today the term has taken on whole new definitions, which are unimaginable and, even, unquantifiable.

From wearable devices that work with your mobile phone to monitor and convey your health condition to a physician, and devices that make sure you have your medicines and electronics built into your house's walls to monitor your heart rate, to implantable devices that help your body work better, modern medical electronics is at the cusp of a new era of medical diagnosis and treatment. This is fuelled by trends like flexible, organic electronics, 3D printing and the Internet of Things (IoT).

Here we look at some futuristic research and development (R&D) in this space, which promise a lot of excitement and good health in the days to come.

Wearables and Big Data: A magical duo

Although it might seem as if the market is flooded with just fitness enhancers, some start-ups are already making some clinically-significant wearable devices, which have the potential to eventually bridge the gap between physicians and patients, making real-time medicine a reality.

Muse is a good example. It uses advanced sensor technology to fit the functioning of a clinical-grade electroencephalogram (EEG) into a beautiful and comfortable headband, which works hand-in-hand with an app to aid care givers an understanding and helping them out in conditions like attention deficit hyperactivity disorder (ADHD), anxiety and depression.

Another is Resound, an iPhone-connected hearing aid that can be customised according to location and situation.

Muse headband
(Image courtesy: www.choosemuse.com)

PIC

SWITCHING THE SMART WAY

Your Partner for Sensor Technology

Leading name in Reed Switch & Sensor Technology with more than 30 years of experience.

Superior quality Reed products, even for price-sensitive markets. Excellent support from concept stage through to series production.

Product overview

- Reed Switches
- SMD Reed Switches
- Reed Sensors
- Level Sensors
- Customized Sensors and PCB-Assemblies

For more information please visit pic-gmbh.com

Sensor Technology

PIC GmbH

Niebelungenstr. 5A
90530 Wendelstein
Germany

Phone +49 911 995906-0
Fax +49 911 995906-99
eMail info@pic-gmbh.com
Web www.pic-gmbh.com

Meet us at

electronica India 2015

Hall 7E / Booth 19

Its many forms...

In his article titled 'Electronics for the Human Body,' Dr John A. Rogers of University of Illinois, Urbana-Champaign, explains how recent advancements have managed to bridge the gap between the soft, curvilinear and continuously-evolving human body and devices that are rigid, planar and physically static. He goes on to categorise modern medical electronics into three approaches:

Soft electronics. This involves configuring hard, inorganic functional materials into thin, open-mesh micro-architectures and embedding these in soft, elastomeric films, so that the resulting electronics can be bent, twisted or pulled without affecting their functionality or performance. When implemented with bio-compatible interface materials, the electronics can be integrated with organ systems such as the brain, heart and skin.

Injectable electronics. One step ahead, this involves delivering electronics further into the depth of the body, and not just on the surface. Flexible filaments serve as support for micro-scale device components that can be transported to targeted regions in a minimally-invasive fashion using thin, releasable injection needles.

Bio-resorbable electronics. Releasing injection needles in the previous case involves bio-resorption of a thin adhesive layer upon contact with cerebro-spinal fluid. Recently, it has been found that this concept of bio-resorption can be extended to entire functional systems, where all active and passive materials dissolve completely in a controlled fashion at programmable rates when immersed in bio-fluids. This opens the possibility of advanced devices for drug release, which provide high performance and stable operation for a specified time period and then completely dissolve, rather than stay on in the body.

—Adapted from: rogers.matse.illinois.edu/files/2015/jamabioe.pdf

A series of small devices being developed by CellScope, a spin-off from UC Berkeley, is also expected to bring advanced diagnostics home to common folks. Oto Home and Oto Clinic, for example, are small devices that fit onto the camera of a smartphone, enabling users to capture images of the ear's membranes, to detect ear infections. The idea behind mobile phone microscopy, a concept pioneered by Fletcher Lab of UC Berkeley, is to develop small devices that add optics, illumination and hardware automation to the cameras of regular mobile phones and tablets, to create mobile microscopes and diagnostic solutions.

More on the anvil

The future holds many more such devices, as was seen at Elsevier's 4th International Conference on Bio-Sensing Technology. One of the interesting technologies demonstrated at the event was a home diagnosis card developed in Sweden by Linköping University and Acreo. The device, the size of a credit card, takes a drop of blood or saliva as input from the user and gives diagnostic information on his or her phone. This information can help monitor diabetes, heart and kidney diseases and even cancer. Screen printing all electronics on the card makes it very cost-effective, too. It currently costs €5 each, but as volume picks up, it can be manufactured at €0.50 per piece.

According to Elsevier's press release on the event, "This means these have the potential to provide patients and doctors in developing countries with accessible, affordable medical tests. For example, the printed card could be made part of the packaging of antibiotics, helping determine which antibiotic would be best to treat a patient's infection. Such printable devices could also be worn like plasters or contact lenses, transmitting information to mobile phones."

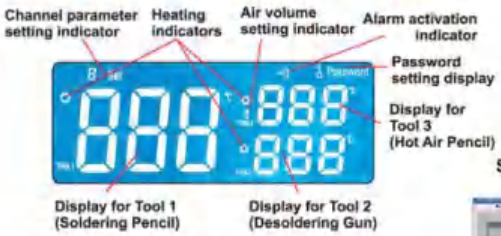
Another recent development in this space is a type of e-skin developed by Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences, China. Born of nanotechnology and flexible electronics, e-skin has the ability to detect changes in pressure, which can, in turn, be used to monitor blood pressure, heart rate and wrist pulse on real-time basis. The team has worked to make the sensor element very sensitive, while making the material very flexible. This they have done

Large SMD ICs/PTH Rework Package MFRS500SUSB-IRHP-S for multilayer PCBs

No External Compressor required • Powerful Hot Air Pencil has in-built Vacuum Pick-up

Expensive multilayer boards always need gentle pre-heating from bottom. Large size SMD ICs as 50x50 mm need powerful hot air reflow with gentle in-built vacuum pick-up. Fine adjustable type UP/DOWN Hot Air Pencil Stand integrated with adjustable PCB Fixture is also necessary.

Control Unit LCD Display Description



Software is provided on CD

Main Power & Control Unit has special EMI and Surge Suppression Filter against mains powerline transients

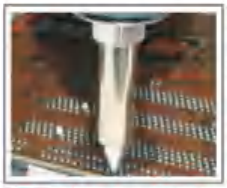
Specifications

- Power : 1150 Watt
- Input Supply : 230V, 50Hz
- Temperature Range
  - Soldering/Desoldering : 200°C ~ 480°C
  - Hot Air Pencil : 100°C ~ 500°C
- Airflow Range : upto 120 litre/min
- Vacuum Suction : 600mm Hg

Supplied Software controls & monitors all parameters thru external Computer (External Computer to be provided by customer)

Scope of supply for MFRS500SUSB-IRPH-S Packaged System includes all of following:

- MFRS-500SUSB Main Control Unit
- IRPH-4 Infrared bottom Pre-heating Plate
- High Power & Powerful Hot Air Pencil
- Adjustable PCB Stand with Hot Air Pencil Holder
- Soldering Pencil with Stand
- Desoldering Pencil with Stand
- Desoldering Wick
- 2 types of Desoldering Nozzles
- Brush type SMD Liquid Flux Pen
- SMD Soldering Tip
- Regular Soldering Tip
- SMD Cutter
- 100 gms Soldering Wire
- Flux Bottle with Needle
- ESD Safe Cleaning Brush
- I228 Illuminated Magnifier
- USB Interface Cable and Monitoring Software
- ESD Safe Soft & Fine Tip Tweezer
- NK2084 Round Hot Air Nozzle, 8.4 mm
- NK1130 Round Hot Air Nozzle, 4.4 mm
- NK2084 Round Hot Air Nozzle, 6.4 mm
- NK3257 Hot Air Nozzle for SOP ICs, 11 x 21 mm
- NK3138 Hot Air Nozzle for PLCC, 30 x 30 mm
- NK3264 Hot Air Nozzle for QFP, 40 x 40 mm
- 1NK3128 HOt Air Nozzle for QFP 14 x 20 mm



Thru-Hole desoldering

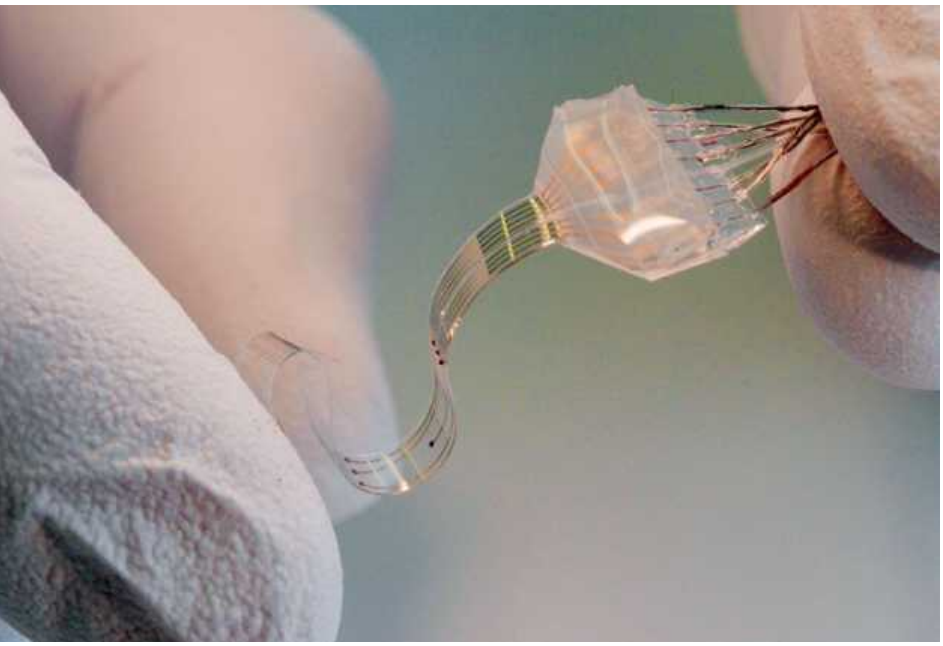
Large SMD IC desoldering

Fine Pitch SMD Soldering

Please visit our website http://indeonline.in/ for complete product range and to download data sheets

Inde Enterprises, 745 Sector 8-B, Chandigarh 160009 • Contact: Romesh Singhal
Email: headoffice@indeonline.in • Cell: 09316134502 • Landline: 0172-4640415

INDE
reliable & caring since 1976



e-Dura implant can help paralysed people to walk again

using carbon nanotubes and sheets of graphene only a few atoms thick.

Helping hand from Big Data

There are many more devices in the wearable cadre; however, the magic ingredient that will make these really useful is smart data analysis.

Dr Michael Docktor, a gastroenterologist at Boston Children's Hospital, also clinical director of innovation and director of clinical mobile solutions, wrote in January in an article about CES 2015, "As these wearables become more of a clinical tool than merely a personal wellness device, data analytics and the ability to serve up meaningful, reliable and actionable data to one's care team will be critical."

Robots to the rescue

Carol Reiley, an experienced computer scientist and roboticist, spoke about future applications of robots in medical technology, at Bay Area Maker Faire 2015. The picture she painted was fantastic—of miniature robots that enter the body through natural openings like the mouth and perform surgeries inside. Some of these are devices like Pillcam that allow minimally-invasive imaging of a person's colon, sensor-augmented surgical tools like the Intuitive Surgical Firefly system that injects a dye for fluorescent imaging to help identify tumours during surgery, augmented reality solutions that allow surgeons to look beneath the patient's skin, robots that assist in therapeutic exercises and so on.

It is interesting to note that famous robotic contests like John Hopkins Robo Challenge have some quests that encourage children to solve problems similar to those experienced in the medical field. A challenge to build a robot that can spot a grape in Jello, for example, can be compared with finding a tumour in soft tissue.

Implants aplenty

When somebody says implant, you might be immediately reminded of devices like the pacemaker, which have been around for decades now. Now, take a look at these implants and you will realise the current generation is incomparable to medical electronics a decade back.

Dissolvable devices for drug delivery. Last year, researchers at Tufts University's School of Engineering developed resorbable, wirelessly-controlled electronic implants made of silk and magnesium that could deliver heat treatment on a patient's body tissues to treat bacterial infections and then safely dissolve. The device consisted of a serpentine resistor and a power-receiving coil made of magnesium deposited onto a silk-protein layer. The silk pocket protected the electronics and controlled the device's dissolution time.

In a test on tissue infected with *Staphylococcus aureus* (*S. aureus*), devices were triggered through a wireless transmitter to administer two 10-minute heat treatments. The devices safely dissolved within two weeks. In a subsequent *in-vitro* lab experiment, another device was made to administer antibiotic ampicillin to kill *E. coli* and *S. aureus*.

According to Hu Tao, first author of the study, "The new wireless therapy devices are robust enough to survive mechanical handling during surgery but designed to harmlessly dissolve within minutes or weeks, depending on how the silk protein was processed."

Helping paralysed people walk again. Historically, one of the biggest problems concerning implants has been the mechanical mismatch between soft tissue and stiff implants. For some, this can cause minor issues like inflammation, while for others, it might mean outright rejection by the body.

A team of multi-disciplinary experts in Switzerland has developed a soft, flexible implant called e-Dura, which mimics the shape and elasticity of dura mater, the protective membrane of the brain and spinal cord.

Armed with electrodes, interconnects and chemotrodes that can handle millions of cycles of mechanical stress, chemical injections and electrical stimulation pulses, the device enables those with a paralysed spinal cord to walk again. It is also capable of delivering electrical impulses and chemicals and even monitoring electrical signals from the brain in real-time. e-Dura, which has been tested successfully on

Anritsu
envision : ensure

Designed and Manufactured in U.S.A.

Anritsu Test & Measurement Solution @ **DGS&D** Rate Contract*

Signal Generator
20GHz , 40 GHz

Spectrum Analyzer
3 GHz,7 GHz,13 GHz,
18 GHz,26.5 GHz, 40GHz

Vector Network Analyzer (VNA)
3 GHz, 6 GHz

Contact for Purchase **Demo and Discussion**

Anritsu India Pvt Ltd
2nd-3rd Floor, #837/1 Binnamangla
1st Stage, Indiranagar, 100 Feet Road
BANGALURU - 560 038
Phone: +91 80 40581300
Email: ACIN-sales@anritsu.com

Anritsu India Pvt Ltd
Office No 18, Ground Floor, Stellar IT Park ,
C-25, Sect 62, NOIDA 201309 (UP)
Phone: +91 120 4211330-31-32
Email: Madhukar.Tripathi@anritsu.com
ACIN-sales@anritsu.com

Anritsu India Pvt Ltd
Eternal Samyuktha, Plot No 1-98/5/2/1, 2nd
Floor B Block, Vittalrao Nagar, Hitech City.
Madhapur Hyderabad - 500 081 Telangana
Phone: + 91 40 47766104
Email: ACIN-sales@anritsu.com

Meera Agencies Pvt Ltd
Plot no 526, Udyog Vihar, Phase V,
Gurgaon, Haryana - 122016
Phone: + 91 124 4226990
Email: madel@meeraagencies.com
nsivakumar@meeraagencies.com

*Please visit DGS&D website for latest information

www.anritsu.com

lab rats, is now moving towards clinical trials. Because it has the same mechanical properties of dura mater, it avoids problems like inflammation and rejection, and can also remain in the body for a long time.

Magic cure for rheumatoid arthritis. British drug-maker GlaxoSmithKline recently demonstrated an implant capable of relieving patients of rheumatoid arthritis, a chronic condition that afflicts innumerable people across the world. The tiny device—the size of a small coin—is embedded into the neck of the patient, from where it influences the nervous system by sending electrical impulses into a major nerve that relays brain signals to the body's major organs.

Firing such impulses for around three minutes a day has shown to reduce the amount of chemicals produced by the spleen, which is responsible for abnormal inflammation in the joints of people with rheumatoid arthritis.

The company is working to develop a smaller version of the device, and hopes that in the future, this ability to bring about a balance in the body can also help cure conditions like diabetes and asthma.

Medicine's tryst with 3D printing is rather exciting

Imagine the day when doctors can print customised implants and medical devices for their patients, right on their desk! Well, that day is not too far off, considering some of the recent advancements in 3D printing.

Old World Labs (OWL), for example, has demonstrated two printers, MC-1 and MC-2, which use a process called stereolithography (SLA) to print objects, unlike most other current-generation 3D printers that use fused deposition modelling (FDM) technique.

OWL's SLA based 3D printers can print microfluidic devices and tissue scaffolds

In an SLA, lasers harden layers of liquid plastic or resin into 3D shapes. This can create much more detailed devices with a smoother finish as compared to FDM. OWL's makers claim that their printers are even better than other SLA printers in the market, as these can print objects that are 200 times more accurate than objects created with other SLA printers.

The company is also exploring useful medical technology that can be printed with these machines. For example, one can print microfluidic devices to deliver drugs to cancer patients. These devices are highly detailed, with tiny channels that circulate prescription drugs into a patient's body.

It is also possible to print bioresorbable tissue scaffolds with resins (pending FDA approval), for cartilage-replacement surgeries. The tissue scaffolds, injected with stem cells, can be implanted in the knee. Once the stem cells grow and replace the missing cartilage, the printed tissue scaffolds would dissolve safely inside the body.

A bright future dotted with challenges

It is evident that medical electronics is part and parcel of our future. The rate at which folks in the industry and academia are innovating in this space, we might actually see implants being sold in medical shops and doctors printing devices on their desks.

However, some practical issues need to be sorted out before that. One, of course, is the well-known issue of battery life, a serious concern that limits the life of implants.

Several options are being explored to overcome this. While some are experimenting with wireless charging, others are working on off-beat options, such as a battery-less cardiac pacemaker developed at University of Bern, Switzerland. The pacemaker charges itself much on the lines of an automatic watch.

Another issue is security. In 2012, American TV show *Homeland* featured an episode in which terrorists hacked into the pacemaker of the US vice president and assassinated him. As readers stood aghast at the possibility, *Forbes* explored it and asserted that it is a real danger.

Around the same time, famous hacker Barnaby Jack and others like him demonstrated the possibility of hacking into medical devices like insulin pumps and pacemakers. While some companies revamped their devices after that, the danger still lurks as technical publications around the world continue to discuss this as a serious issue. Security features have to be made mandatory in medical devices, if patients are to have complete confidence in these.

In the years to come, these issues will hopefully be ironed out, so that the wonderful research by today's labs can, so to say, win a place in people's hearts! ●

Why I Made The Switch.

"All over our 4 plants, anything powered is checked with an Extech meter or clamp. They're used all day, every day. We don't need anything else—the Extech kit covers everything."

Have You Made The Switch to Extech?

Have you switched from another brand of test equipment to an Extech Meter? We want to hear about it! Please send your switch story to flirindia@flir.com.hk
All contributors will receive a FREE FLIR Power Bank!

EXTECH® INSTRUMENTS
A FLIR COMPANY

Forget "Good" and "Better". Go For Best.

Get the best clamp meter for your job—one that works as hard as you. The Extech EX840 is serious about safety and ruggedness—without compromising performance or innovation. Only Extech offers CAT IV-rated, 1000A AC/DC capabilities, True RMS precision and a built-in infrared thermometer for fast hot-spot detection. Tough. Smart. Like you.

For more information, please contact us at:
FLIR Systems India Pvt. Ltd. 1111, D Mall, Netaji Subhash Place, Pitampura, New Delhi - 110034 • **Tel:** +91-11-4560 3555
Fax: +91-11-4721 2006 • **Email:** flirindia@flir.com.hk • **Website:** www.extech.com

Connected Healthcare, BAN and Weaponised Pacemakers

Dilin Anand is a senior assistant editor at EFY. He is B.Tech from University of Calicut, and is currently pursuing MBA from Christ University, Bengaluru

63,895,000,000. That is how many rupees are expected to be spent by healthcare providers in India on devices, telecom services, data centres and information technology (IT) in 2015 alone, according to Gartner.

Medical electronics is a lot more exciting now, with electronic components that resorb after use as well as stents that sense blood flow and temperature that these then transmit for analysis and storage. While you can read about more such amazing innovations in the article on page 26, this article gives you a glance at the electronics behind the scenes—components, devices, standards and other elements that power these innovations to life.

Imaging and diagnostic applications

In the east, China's Nanjing University is working on an acoustic diode technology that could improve the performance of ultrasound systems. Similar to the usual diodes that allow current only in one direction, this diode allows sound in just one direction, thus eliminating acoustic disturbances caused by sound waves going in both directions.

Another recent addition for those into designing ultrasound systems is the availability of production processes and tools for full-scale capacitive micromachined ultrasonic transducers (cMUTs). These allow ultrasound imaging to enjoy higher lateral and axial resolution, higher speed and even real-time 3D imaging for diagnostic applications for areas such as ophthalmology and dermatology.

On the other side of the planet, University of Michigan's Wireless Integrated MicroSensing and Systems (WIMS^2) Centre has made progress in its work on magnetoelastic sensors. By applying the devices into the circulatory system and bile ducts it is able to detect biliary sludge on a stent in the bile duct or tissue accumulation on arterial stents in cardiology.

EBR Systems has developed an implantable externally-powered grain-sized

MAX TECHNOLOGY & CO.

MAX GOLD

AN ISO 9001:2008 CERTIFIED COMPANY

MAX 850 : SMD REWORK STATION

- Hot-Air Soldering & De-Soldering Station
- Different Nozzles to suit your needs

MAX 7805: 7-IN-1 SMD REWORK STATION

- SMD Rework Station with Synchronized Air & Temperature.
- Micro Soldering Pen.
- Battery Analyzer 1.5V to 18V DC Regulated Digital Power Supply with Reconditioning System.
- Voltage & Ampere Check with Continuity Buzzer.
- Test Speaker, Ringer & Vibrator.
- Turn ON any mobile without Battery.
- Charge your mobile battery without handset.
- Car Charger Socket for Mobile Charging.

MAX 525 : BATTERY ANALYZER (MOBILE TESTER)

- Battery Analyzer. • Micro Soldering Iron.
- Digital Power Supply with Reconditioning System.
- Voltage & Ampere check with Continuity Buzzer.
- Turn ON any mobile without battery.
- Charge your Mobile battery without Mobile Handset.
- Speaker, Ringer 8| Vibrator check.

MAX 8550 : 3-IN-1 SMD REWORK STATION

- Hot-Air Soldering & De-Soldering Station.
- Micro Soldering Station.
- 1.2V DC-18V DC Digital Regulated Power Station.
- Different Nozzles to suit your needs.

MAX 535: VARIABLE SOLDERING STATION

- 5-35 Watt Soldering Iron.
- Tip-Heating Technology.
- Multi-Bit gives you Fine Quality Soldering.
- For all types of electronic works.

MAX 550: MICRO SOLDERING STATION

- 5-15 Watt Soldering Station.
- Tip-Heating Technology.
- Multi-Bit gives you Fine Quality Soldering.
- For Dentist & Jewellery Wax Designing.
- Watch Repairing & Electronics SMD Soldering Works.

MAX 586 : PTH DE-SOLDERING STATION

- Vacuum Pump type De-Soldering tool.
- Equipped with Nozzle with Built-in heater which provides excellent thermal recovery.
- Variable heating control to suit your needs.

MAX 250: POWER SOLDERING STATION

- 25 Watt Soldering Iron.
- 2Amp/ 1.5V - 18V Digital Power Supply.
- Digital Display helps in controlling the Voltage accurately.

MAX HIGH QUALITY LONG-LIFE SOLDERING BIT/TIPS

- High Quality Long-Life Soldering Bit/Tips.
- Corrosion Resistant.
- Fine Quality Soldering.

MAX SOLDERING PEN

- 15W Soldering Pen.
- 35W Soldering Pen also available.
- Energy Efficient.
- Tip Heating Technology.

MAX SILICON LIQUID FLUX

MAX FLUX

- Non-Messy Output. No Residue on PCB.
- No Foul smell or Smoke.
- Very high Ignition Temperature - approximately 400 Degrees.
- Environment Friendly. Non Corrosive. Non Conductive.

MAX SILICON FLUX

- For Soldering & De-Soldering of all types of SMD, SMT & DIP Components.
- Environment Friendly. Non Corrosive. Non-Conductive.

366, Ahmed Mansion, 1st Floor, Lamington Road, Mumbai-7. Tel.: 91-22-2382 1313, 2384 1313, 6124 6393 Fax: 91-22-6633 3729

E-mail: info@maxtechnoindia.com, maxtechnoindia@gmail.com • Website: maxtechnoindia.com

DISTRIBUTOR: Delhi-Metro Electronic Product Tel.: (011) 2386 8195, 47508195, 23875355, E-mail: infometroq@gmail.com. • **DEALERS—Mumbai:** Skyking Agencies Tel.: (022)2388 6857/7629,2387 1582, Fax: 91-22-23860523 E-mail: skyking@vsnl.net • **Chennai** - Arihant Impex - Tel.: 044-42149893, 42131652 Fax: 91-44-42041651Precious Electronics Tel.: 044-28549095, 28549166 Fax: 91-44-28414729, E-mail: precious@md2.vsnl.in **Kolkata** - Mikado Electronics Tel.: (033) 40066064, 40066020, **Baroda** - King's Electronics Tel.: (0265) 2420538, 2420207, E-mail: kingsqline@indiatimes.com. **Kerala** - Indiatel Tel.: (0484) 2354013 **Bangalore**- Abhishek Electronics Tel.: 080-22293170 / 41140170, Email: kailashjain75@yahoo.co.in

Electroadhesives

Aptly named, Grabit Inc. is a company that has built an electrically-controllable adhesion technology that can be used in biomedical lab automation, medical devices and surgical equipment. What is it? Electroadhesion uses electrostatic forces between substrate materials and electroadhesive surface to induce adhesion between materials through a set of conductive electrodes deposited on the surface of a polymer. Who knew that someone could set up a whole company simply on the basis of 'Opposite charges attract.'

pacemaker called Wireless Cardiac Stimulation System (WiCS). It allows for bi-ventricular pacing where a traditional pacemaker paces the right ventricle and EBR WiCS electrode paces the left ventricle.

Transforming the data collected above into graphical form can be done using embedded graphics solutions like AMD Embedded Radeon HD 7850 GPU. Based on Graphic Next Core (GCN) architecture that accelerates medical imaging, it provides three times improved performance with detailed medical image visualisation and other advanced graphics-driven capabilities.

Detecting substances

CAP-100 capacitive liquid level sensor from Gems Sensors & Controls allows level sensing through a wide variety of materials. These compact sensors can detect substances like waste, reagent, buffer or diluents, which would be useful for vessels containing bio-hazardous liquids in a sealed container. These can also be calibrated for use as proximity sensors.

Some manufacturers are also looking at making their components more rugged, such as FlexiForce Sustained Stability Series 301 from Tekscan. Made from pressure-sensitive ink, these can withstand and measure force and pressure in a wider range of environments. It is claimed that reducing drive voltage or feedback resistance can extend the range further.

Other novel uses include the use of temperature sensors to ensure the best application of treatments in dermatology. One example is where SynerionVelaShape III uses Exergen's non-invasive infrared (IR) temperature sensor placed inside the applicator to continuously monitor skin temperature, while allowing the treatment to continue unhindered.

Moore's Law keeps driving integration

For more integrated components, Honeywell's HumidIcon digital humidity and temperature sensors integrate multiple functions in a single compact package. These can be used in respiratory therapy, medical incubators and medical micro-environment applications.

Engineers at Georgia Tech Research Institute have designed a sensor that can detect chemical vapour using its package of three sensors and a radio frequency identification (RFID) chip. Current design of the chip requires power from an incoming signal beam to enable sending data out, but researchers hope future models would be able to use ambient energy.

Engineers usually have to face difficulties when building systems out of separate pump motors, gearboxes and drives due to design complications and uncertainty that comes with separate components. With the aim to reduce the cost for engineers at original equipment manufacturers, Watson-Marlow Pumps Group has brought out a brushless DC gear motor with a fully-integrated speed controller that can be used in medical devices.

Building systems enabling better healthcare

The Internet of Things (IoT) is driving the creation of Web-connected medical devices that keep track of your health and medication, prompting your doctor about potential threats or medical events. One such device is Vaica's SimpleMed + medication compliance device that uses Telit Wireless Soltuions' GC864-QUAD V2 for mobile connectivity that allows quad-band connectivity using a mobile network.

In March 2015, Redbend and Telit also announced their partnership that allows designers to avoid IT integration at their end if they use the hosted service to manage their machine-to-machine (M2M) devices.

Also interesting is an electronic patch designed by Sensium that can check a patient's vital signs every two minutes and wirelessly send it to authorised medical devices. The patch itself is a low-power 915MHz wireless unit that can measure heart rate, respiratory rate and auxiliary temperature.

Maxim Integrated launched a reference design for sensing galvanic skin response (GSR) in mobile medical and fitness applications with improved accuracy. Offered in a wristband form factor, MAXREFDES73# includes body surface temperature readings, Bluetooth communications and a rechargeable battery that lasts up to one week on a single charge.

Google Glass could be helpful

Electronic health records blended with wearable electronics show promise to enable doctors to improve the time they spend with their patients. Texas based Pristine's app EyeSight lets doctors transmit live video of wounded patients from Google Glass to computers and phones.

There is also Augmedix, a system that would roughly translate information from Glass's audio-visual stream directly into a patient's medical record. And Healium is developing an app that would let doctors share patient information through Glass.

There is also some buzz about a helmet-borne system developed by Vijay Varadan and his research

team at University of Arkansas. It lets you detect brain injury using a network of flexible sensors. Collected data is then sent through ZigBee and Bluetooth to a receiver.

In 2014, Novartis also announced that its eye-care division, Alcon, would soon license its smartlens technology for all ocular medical uses. This technology involves the use of non-invasive sensors, microchips and other miniaturised electronics that are embedded into the contact lens. A LinkedIn search on Alcon showed the profile of an electronics and software lead engineer at Alcon, which had Institute of Electrical and Electronics Engineers (IEEE) 802.15.6 standard listed. What is that?

LAN, WAN and, now, BAN

After local area network (LAN) and wide area network (WAN), you now have body area network (BAN). Also known as body sensor network, this is effectively a wireless network of wearable computing devices and implantables.

IEEE 802.15 Task Group 6 (BAN) is developing a communication standard optimised for low-power devices and operation on, in or around the human body (but not limited to humans) to serve a variety of applications including medical, consumer electronics, personal entertainment and others.

New memory for wearables

Targeting such wearable devices for applications like hearing aids, pulse meters and activity trackers, Fujitsu has introduced their new 1Mbit serial ferro-electric random access memories (FRAMs). The new FRAM memory delivers 77 per cent reduction in surface mount area, apart from contributing to longer battery life by minimising power consumption during write operations. The FRAM developed by Cypress is immune to corruption by magnetic fields and radiation, thus allowing for its use in medical wearables for capturing data instantly with complete security.

Maxim's newly-designed gamma resistant non-volatile memory based on 1-wire technology allows calibration of consumable medical sensors, tools and accessories to their host medical instrument in the field.

Meeting standards

Got an amazing idea for a wearable device that you believe will change the world? Figured out all the hardware and software design, too? If you want to see your device enter the market and start selling, you have to ensure that it meets medical standards. Do not despair though, because Shreekant Pawar, co-founder and CMO at Diabeto, has just the advice you need.

"When we were developing Diabeto, in the early stages, we were completely unaware of medical standards; we did not even know what standards were. Only when we developed the first prototype, one investor asked us if our design was according to the standards. Just like us, many medical devices start-ups are completely unaware about the prevailing medical standards," says Pawar.

He explains that, broadly there are two types of standards, namely, vertical and horizontal. Typically, a vertical standard is specific to a product or a device, while a horizontal standard applies to a wide range of devices. International Organization for Standardization (ISO) 13485 and ISO 14971 are examples of the most important horizontal standards that are widely used.

ISO 13485 is optional, but is considered the *de facto* standard for companies that sell in Europe. One good thing about ISO 13485:2003 is that, it is made specifically for medical devices and is accepted worldwide, except the USA. The US FDA follows a different system. Having said that, there is 90 per cent overlap between ISO 13485 and the US FDA system.

ISO 14971 covers risk management. Your device needs to pass

Touchscreen phone and smartwatch with health sensor mobile app

all possible scenarios or operation modes in which there is a failure situation.

Pawar explains that, "As a medical device designer, one needs to be absolutely clear with two documents/standards, IEC 60601-1 and IEC 60601-1-2. If your device adheres to these documents, you would be what they usually call 601 compliant. The 601 standard is primarily for electrical safety and electromagnetic compatibility (EMC). If your medical device is using an external power supply, or even a step-down transformer, it needs to be 601-compliant as well. For EMC, testing needs to be rigorous to ensure that your device not only functions but also keeps functioning even with electromagnetic interference."

"There are two main safety approvals for power supplies. Information Technology Equipment (ITE) IEC 60950-1 and Medical Electrical Equipment (MEE) IEC 60601-1. There is also ISO 13485 certification, which states requirements for a comprehensive system of manufacturing of medical devices," says Chris Jones, product marketing director of Artesyn Embedded Technologies. IEC 60601-1 is a safety standard for medical electrical equipment, whose third edition includes general requirements for safety as well as essential performance.

The software and firmware that goes in your medical device programming is also regulated. These are broadly classified by two testing approaches that are driven by simple code and complex code. For simple code, refer IEC 60601-1 Annex H, and for more complex code driven firmware, check IEC 62304 document.

"Making your medical device is a complicated and time-consuming process, and care should be taken to befriend these standards right from the prototype-design phase. Once the device is designed keeping standards in mind right from day one, the process becomes simpler, linear and cascading," adds Pawar.

Securing your body

Of course, with wireless access comes the possibility of hacking. This could be especially painful now that the devices are on your body.

Barnaby Jack was someone who had already demonstrated how it was possible to hack a diabetic's insulin pump to deliver a fatal dose as well as how to hack a pacemaker from 15 metres away and get it to deliver an 830-volt jolt to the user. Unfortunately, he was found dead under suspicious circumstances a week before his scheduled demonstration at a major black hat convention with cyber security experts at Caesar's Palace. So, how can this problem be solved?

The knee-jerk response would be what former US vice president Dick Cheney's doctors did. They disabled his pacemaker's wireless connectivity to thwart possible assassination attempts. More thought-out approaches include mobile medical device benchmark initiative that was implemented by Centre for Internet Security, whose resulting benchmarks are recommended as guidance for device makers to harden a device's security.

Indeed, there are embedded cryptographic co-processors that come with processors like Cortex-M4 based STM32F479 to power applications requiring high security. A cryptographic co-processor is a hardware module specialised for encryption and related processing to prevent unauthorised retrieval of data. However, can chips like these solve the problem single-handed? Probably not. Jack had also added that many hospitals are using out-of-date software as they are afraid of running foul of regulations such as those formulated by the FDA. As a result, it is known that malware is rampant on hospital networks.

It looks like healthcare technology advances have gotten us to the stage where you do not need to worry that much about contracting a biological infection, but you do need to worry a lot about infecting yourself (and your devices) with malware. ●

Soldering Robots for higher production without increasing workforce, provides consistency in each soldering joint with higher reliability

200x200 to 500x500 mm X-Y traveling, in 3 & 4-Axis

Optional Solder Fume Extraction integrated with Soldering Head

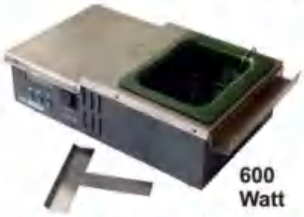
> 4500 Soldering Robots working reliably in worldwide, many in India with repeat orders

Few 100's working all over India

Ready-to-use Package

70 Watt

90 Watt



600 Watt

Hi-temperature stability uses Metallic Heating Element, not ceramic
Low cost Model ISSD70

Best-price-performance for Fine SMD soldering, Solar Panels, LED Lighting
Model DSSLF04HESD

Digitally Controled Solder Pot
Nanometric Ceramic Coated 91mm x 135mm Solder Bath
Hi-reliability Model I100-15S

2 - Operators Powerful Solder Fume Extraction System FumePRO201-75

Digital Drying Oven IDO2405
340x325x325 mm internal size
870 Watt, 80°C ~ 220°C range

STANNOL Germany

0.5 mm, 500g P/N: 648111
0.7 mm, 500g P/N: 648132
Lead Free Soldering Wires

0.7 mm, 500g P/N: 519244
Leaded Wire

Hi-Torque ESBT-8000 (10~28 Kgf-cm)
Low cost ESBT-4500 (1.5~10 Kgf-cm)

Hi-rel, light weight, low reaction force BRUSHLESS Electric Screw Drivers

ESD Safe Dry Storage Cabinet
10 ~ 50% RH, Model IDSC3215
996x450x1042 mm internal size

Matte Finish ESD Table Mats

- 0.9 meter x 10 meter
- 1.0 meter x 10 meter
- 1.2 meter x 10 meter

Master Toolkit ITK-MAS-2612 for field repair & maintenance

Wrist Strap and Footwear Combo Tester Model 492E

Portable & Light Weight LED Illuminated Magnifier
Low cost Model 8092LED

ESD Safe 4 - Levers adjustable PCB Rack Model IPMR-805

Please visit our website http://indeonline.in/ for complete product range and to download data sheets

Inde Enterprises, 745 Sector 8-B, Chandigarh 160009 • Contact: Romesh Singhal
Email: headoffice@indeonline.in • Cell: 09316134502 • Landline: 0172-4640415

INDE
reliable & caring since 1976

Bio-Sense-Us with Biosensors

Akul Sabharwal is an electronics and communication engineer. He is currently working with Simmtronics Semiconductors Ltd

A biosensor is an analytical device that converts a biological response into an electrical signal. The term biosensor is often used for sensor devices used to determine the concentration of substances and other parameters of biological interest even where these do not utilise a biological system directly.

With an estimated 60 per cent annual growth rate, the major demand for biosensors is coming from health-care industry, but with some pressure from other areas such as food-quality appraisal and environmental monitoring. The current types are potentiometric and amperometric biosensors and colourimetric paper enzyme strips. However, all main transducer types are likely to be thoroughly examined, for use in biosensors, over the next few years.

A successful biosensor must possess at least some of the following features:

1. The biocatalyst must be highly specific for the purpose of analyses, be stable under normal storage conditions and show good stability over a large number of assays.

2. The reaction should be as independent of such physical parameters as stirring, pH and temperature as is manageable.

3. The response should be accurate, precise, reproducible and linear over the useful analytical range, without dilution or concentration. It should also be free from electrical noise.

4. The complete biosensor should be cheap, small, portable and capable of being used by semi-skilled people.

Besides, there should be a market for the biosensor. There is little purpose developing one if other factors encourage the use of traditional methods and discourage decentralisation of laboratory testing.

How does it work

The key part of a biosensor is the transducer (shown as the green box in Fig. 1), which makes use of a physical change accompanying the reaction, which may be:

1. The heat output (or absorbed) by the reaction (calorimetric biosensors)

2. Changes in distribution of charges causing an electrical potential to be produced (potentiometric biosensors)

3. Movement of electrons produced in a redox reaction (amperometric biosensors)

4. Light output during the reaction or a light absorbance difference between reactants and products (optical biosensors)

5. Effects due to the mass of reactants or products (piezoelectric biosensors)

There are three so-called generations of biosensors. First-generation biosensors are those in which the normal product of the reaction diffuses to the transducer and causes an electrical response. Second-generation biosensors involve specific mediators between the reaction and the transducer in order to generate improved response. And third-generation biosensors are those in which the reaction itself causes the response and no product or mediator diffusion is directly involved.

An electrical signal from the transducer is often low and superimposed upon a relatively high and noisy (that is, containing a high-frequency signal component of an apparently random nature, due to electrical interference or generated within the electronic components of

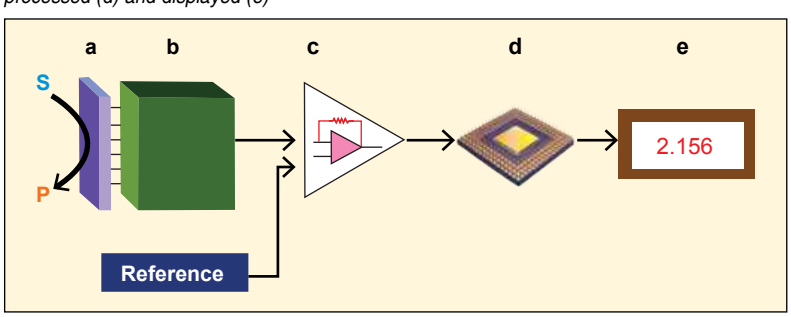


Fig. 1: Schematic diagram showing the main components of a biosensor. The biocatalyst (a) converts the substrate to product. This reaction is determined by the transducer (b), which converts it to an electrical signal. The output from the transducer is amplified (c), processed (d) and displayed (e)

Fig. 2: Glucometer that uses enzyme glucose oxidase to break blood glucose down

Fig. 3: Pregnancy test that detects hCG protein in urine

the transducer) baseline. The signal processing normally involves subtracting a reference baseline signal, derived from a similar transducer from the sample signal, amplifying the resultant signal difference and electronically filtering (smoothing) out the unwanted signal noise.

The relatively-slow nature of the biosensor response considerably eases the problem of electrical noise filtration. The analogue signal produced at this stage may be output directly but is usually converted to a digital signal and passed to a microprocessor stage where data is processed, converted to concentration units and output to a display device or data store.

Advantages

Some advantages are:

1. Rapid, continuous measurement
2. High specificity
3. Very less usage of reagents required for calibration
4. Fast response time
5. Ability to measure non-polar molecules that cannot be estimated by other conventional devices

Applications

1. Monitoring glucose levels in diabetic patients
2. Food analysis
3. Environmental applications
4. Protein engineering and drug-discovery applications
5. Waste water treatment

Future prospects

Trends in biosensor technology over the past 30 years have taken this equipment from a simple and cheap component to the integration of several sensor systems into one unit including multiple components, making these systems smaller and tailored for mass production. The vision for the biosensor industry is to create micro-scale technology that will be suitable for performing sample preparation, analysis and diagnosis all with one chip. ●

Indian Brain Behind New Painless Cancer Detection Device

Janani Gopalakrishnan Vikram is a technically-qualified freelance writer, editor and hands-on mom based in Chennai

Dr Srirang Manohar is the man who gave PAM a fillip

According to World Cancer Research Fund International, breast cancer is the most common type of cancer in women, and the second most common cancer overall. Doctors recommend that women frequently take tests to detect the onset of cancer early, when it can still be treated. Yet, current procedures for cancer detection put many women off, especially in rural areas.

A new method, proposed by a team from University of Twente, The Netherlands, in *Nature Scientific Reports* (refer *www.nature.com/articles/srep11778#ref48*) could offer a way out. The paper presents a photoacoustic method for imaging soft tissues, which has, in turn, been applied to develop a non-invasive, economical and effective method to detect breast cancer.

We caught up with Dr Srirang Manohar, associate professor at University of Twente's Biomedical Photonic Imaging group to find out more about this new technology, which they call PAMmography.

Concept to device

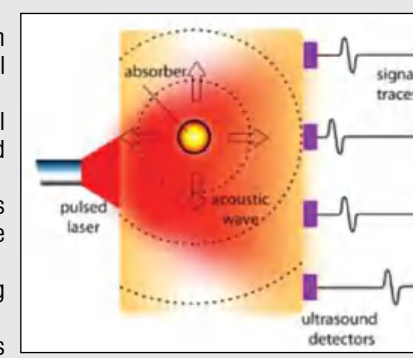
In 2001, Dr Manohar, who did his PhD from Indian Institute of Science (IISc), Bengaluru, learnt of a vacancy at University of Twente, where some pioneering work was being conducted in photoacoustics, involving light interactions with biological tissues. In the new project, applicability of the method to breast imaging was to be investigated.

Dr Manohar's involvement gave the project a fillip, and four years later they had a working prototype called Twente photoacoustic mammoscope (PAM). The device has consistently evolved since then, leading to the recent technical paper, which reports a successful study on 29 patients using an upgraded ver-

Imaging with light

The key technology behind PAMmography is photoacoustic imaging. Methodology:

1. Light pulses are applied to the tissue as a probing energy beam, with the aim to visualise sites where optical absorption takes place in the tissue.
2. Absorbed light is converted into heat, which causes a rise in temperature, resulting in thermal expansion.
3. When short pulses of light are used, thermal expansion causes mechanical waves to be generated from areas where light was absorbed.
4. The mechanical wave has frequency components in the ultrasound regime and can be detected at the boundary of the tissue using ultrasound detectors.
5. From this point on, common ultrasound imaging takes over.



The concept behind PAM

The use of light for imaging soft tissues provides many advantages:

1. Interaction between light and haemoglobin gives a high absorption contrast, which results in a good-quality image.
2. Red and near-infrared wavelengths used by this method constitute non-ionising radiation, which means the tissue is unaffected by tests.
3. It also enables spectroscopy to identify more physiological information about the tissue.
4. Use of light ensures that this technique is non-invasive. Patients just have to lie, breast down, on the mammoscope, for the tests to be conducted.

sion of the device. (Read in detail about the device upgrades and trials at *efytimes.com/e1/fullnews.asp?edid = 171496&title = Cancer-Is-Painful-But-Its-Detection-Can-Now-Be-Painless*)

While PAM by itself is designed specifically for breast cancer detection, the team has also developed other variants and implementations that can be used for detecting skin cancers and inflammation of finger joints in rheumatoid arthritis.

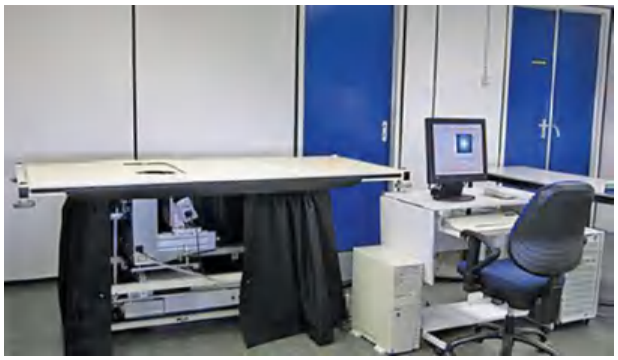
On to PAM 2.0

So far, the team has only applied the device to study breasts already known to have cancer. Now, the team is in the process of developing a second version of the device called PAM 2.0 with which they hope to do imaging with more than one wavelength and full-breast coverage. This will be used in the near future on imaging breasts without prior knowledge of cancer.

"While we have had a laser group in our university develop a laser for us, we use a commercially-available laser with two wavelengths for PAM 2.0. Regarding the ultrasound detectors, we have developed a specialised system for PAM 2.0 together with an ultrasound detector manufacturer. We have a detector system comprising 512 elements made of piezoelectric material CTS 3203-HD (CTS Communications Components Inc., Albuquerque, New Mexico). This is being tested at the moment," says Dr Manohar.

As far as the electronics go, there are two stages at which they require specialised systems. On the analogue side, for processing signals from the ultrasound detector, they have developed preamplifiers to be mounted at close proximity to the detector elements. They have used 8-channel low-noise preamplifiers based on ADA4896-2 (Analog Devices, Norwood, MA, USA) as the analogue front-end.

The second stage where they require electronics is for data acquisition (DAQ). For this, they are currently using a system built by National Instruments, an NI PXIe-7966R FlexRIO field-programmable gate array (FPGA) module with which four digitiser modules (NI 5752) are coupled. Each digitiser contains 32 simultaneous 50MS/s, 12-bit channels.



Twente photoacoustic mammoscope

The digitisers themselves have an analogue front-end each based on low-noise AFE 5801 chips (Texas Instruments Inc., Dallas, Texas, USA). They are also developing their own DAQ system with the help of PA Imaging BV, a company that they are financially involved with.

"We are also working closely with a company called Oldelft BV (Delft, The Netherlands) for the new ultrasound detectors in PAM 2.0," adds Dr Manohar.

Is PAM better than conventional imaging

"I believe that given time and with further technical development, PAMmography has the potential to address the drawbacks of conventional imaging methods," says Dr Manohar. He explains that x-ray mammography sometimes misses cancers, and often sees cancer when there is none. It does poorly especially in breasts with more glandular tissue (in younger breasts). It also uses ionising radiation and requires severe breast compression. Ultrasound imaging has poor contrast for breast cancer and misses smaller lesions. MRI is very expensive and therefore not very accessible. It also uses contrast agents.

He adds, "I think PAMmography can be cheaper than MRI, and perhaps at the same level as ultrasound imaging. Since it uses light, it does not ionise tissue and harm it. Further, there is much to be gained by using various colours of light—in a spectroscopic manner (which we have not yet implemented)—because this can give you more fundamental molecular knowledge of the tissue, which may help in making more accurate diagnoses."

The path to commercialisation

"We have a spin-off company called PA Imaging BV in which three of my colleagues and I have financial involvement. This company is the vehicle responsible for engineering the new PAM 2.0 device into a version that can be commercialised," says Dr Manohar.

He explains that while they publish all their scientific work, they protect intellectual property in the form of patents.

Interest levels in India

Asked about the response in India to this technology, Dr Manohar says that he is working with two groups in IISc on image reconstruction. However, from the hardware point of view, there is still no concrete collaboration with any group or party.

"There is mutual interest with a group in Coimbatore that has developed a DAQ for ultrasound imaging. We will have to follow this up in the future," he says, adding that he is open to collaborate with others on areas like ultrasound detection, fast and low-noise DAQs and stable, compact, analogue front-ends.

Readers might be interested in knowing that he is also willing to advise on development for indigenous requirements, and he could also help by testing the most promising of these systems at The Netherlands or in India. ●

An EFYGROUP EVENT | Exhibition & Knowledge Partner ELCINA

www.efyexpo.com

INDIA ELECTRONICS WEEK

January 11th-13th, 2016 • Bengaluru

Bangalored!

In 2016, EFY Expo will be held at
Bangalore as part of India Electronics Week.
Namma Bengaluru!

Electronics ForYou expo

Innovate. Design. Manufacture. Source.

January 11th-13th, 2016 • Bengaluru

For more information, talk to us at +91-11-40596605 or email at growmybiz@efy.in

International Partners

Partner Associations

Media Partners

How Smartphones, Cloud and Data Analytics are Driving RF Test

Abhishek A. Mutha is a senior technical correspondent at EFY

To succeed in dealing with the most demanding radio frequency (RF) design challenges, engineers need instruments with the latest technology and capabilities. Here, we take a look at some interesting test equipment for RF applications that have been recently introduced in the market. We also highlight how these tools are enabling engineers solve problems in designs and maintain existing RF systems and infrastructure.

Wider real-time bandwidth driving better designs in defence

Spectrum analysers have been used for the development of electronic warfare and radar systems for a long time now. With traditional measurements becoming inadequate for today's modern systems, a signal analyser with real-time spectrum analysis and vector signal analysis could be an alternative for spectrum analysers.

Fig. 1: N9040B UXA X-Series signal analyser (Image courtesy: www.literature.cdn.keysight.com)

Vishal Gupta, senior application consultant (RF/MW, Surveillance), Keysight Technologies, says, "When you look at platforms to perform wideband and radar-signal analysis, earlier the widest real-time bandwidth available was 160MHz. Now, there is up to 510MHz of analysis bandwidth available."

The wide bandwidth range up to 26.5GHz permits accurate measurement of parameters like wideband chirp linearity in advanced radar systems. Engineers can use the intuitive, multi-touch 35.8cm (14.1-inch) display to pinch or zoom signals for better analysis. Based on proprietary technologies, it allows for a deeper analysis of transient, wideband and elusive signals.

Gupta says, "There has always been demand for higher analysis and real-time bandwidth, mainly from aerospace and defence engineers who want to analyse their wide-band radar and electronic warfare and satellite signals."

He adds, "The introduction of UXG series signal analyser with real-time spectrum capability will bridge this gap."

Anticipating and fixing problems before these fail your radio system

From police personnel and fire departments to usage in private sector activities such as construction, security and maintenance, land mobile radio (LMR) systems have been extensively adopted for communication between geographically-dispersed teams and mobile personnel over predefined frequencies.

Today, LMR is also used by small- and medium-sized organisations to consolidate their business operations. The market is slowly witnessing a growing approval for digital LMR systems and it is also anticipated that its adoption will surpass analogue LMR in the years to come.

An LMR system can be as simple as a base station and two handheld units or as complex as hundreds of mobile units and various other devices. At any level, it is important to maintain and monitor the health of an LMR system and its components.

Fig. 2: Model 3141 channel power monitor

Fig. 3: Model 4044 power sensor can be used in conjunction with 3141 Channel Power Monitor to measure the output power of either analogue- or digitally-modulated radios at power levels up to 100W

Fig. 4: Model 4045 directional power sensor can be used for forward and reflected composite power measurements at power levels up to 500W

Fig. 5: iVA-0627A cable and antenna analyser from Kaelus (Image courtesy: www.kaelus.com)

A new power measurement device launched recently serves the purpose of monitoring the components in analogue or digital LMR systems functioning between 144MHz and 960MHz.

Radio units, antenna, transmission line and power combiner are the usual elements that constitute an LMR. The channel power monitor from Bird Technologies monitors all elements of a radio system with the help of RF power sensors placed throughout the system. Apart from monitoring individual radios of a system, it also measures the system's total performance.

Engineers can monitor 16 channels, which can be expanded to accommodate new radio systems. They are alerted to measurement parameters such as composite, forward and reflected power and out-of-spec conditions displayed and updated on a dedicated Web page generated by the model 3141 channel power monitor in real-time.

Data can be accessed on computers, tablets or mobile phones, which engineers can interpret to set alarms or configure the system to alert via email in case of failure conditions such as low/high power or poor-antenna voltage standing wave ratio (VSWR). Data logging capabilities further allow an engineer to view degraded performance and avoid emergency conditions.

Making RF measurements easier, quicker, more efficient

A notable current trend in network testing is the utilisation of simple, easy-to-use test equipment such that fundamental test behaviour and interpretation is not limited to professional RF engineers. There is also a growing use of analytics and cloud to boost efficiency in using such tools.

In line with this trend, this new analyser from Kaelus, equipped with rechargeable lithium-ion batteries, reliably enables users to measure VSWR/return loss and the position of VSWR/return loss faults in their RF framework, thereby allowing estimation of distance to fault (DTF) in the RF path.

Bluetooth and universal serial bus (USB) capability in the iVA series cable and network analyser provides flexibility in measurement and opens new avenues of multi-port and sweep testing. It also allows engineers to make and view measurements by connecting this rugged device to the Bluetooth interface of a mobile phone, tablet, laptop or personal computer. There is an app particularly available for Android devices to view measurements on mobile devices.

The uncomplicatedness of this device significantly decreases test time on site as the site certification sweep testing process is made simpler. It is possible to directly connect this analyser to the device under test. This handy device can be used for interference checking in its spectrum monitor mode.

Make your mobile phone an RF meter

In sync with the IoT phenomenon, it is now possible to turn your Android phone into a power meter that would communicate with RF sensors to fetch power measurement data. Best suited for field engineers, Bird RF Meter app allows power measurements to be made on-the-go. With an intuitive and easy-to-use user interface, it enables engineers to set up sensors with appropriate settings and configuration options such as zeroing calibration, selection of element types, offsets and others.

The app automatically detects sensors and displays data of each sensor with serial numbers, making identification easier for engineers. In the current version, it shows readings for parameters like burst power, VSWR, crest factor, peak power, forward and reflected power (true average power) and complementary cumulative distribution function (CCDF). It is compatible with most USB field sensors from Bird Technologies.

A screenshot of the app while performing measurement (Image courtesy: www.birdrf.com)

TELEDYNE LECROY
Everywhereyoulook™

World's first and the only

100 GHz
Real-Time Oscilloscopes

With 100 GHz bandwidth and 240 GS/s sample rate, the LabMaster 10-100Zi real-time oscilloscope boasts the world's highest bandwidth and fastest sampling rate. This world-leading performance is key to analyzing and understanding the fastest phenomena found in R&D labs where engineers and scientists are working on next-generation communication systems, highbandwidth electrical components, and fundamental scientific research.

KEY FEATURES

- 10 GHz to 100 GHz Industry leading Analog Bandwidth
- Up to 240 GS/s sample rate
- Long Memory - Up to 1.5Gpt/ch
- Modular Design - build system with 80 channels of 36 GHz each
- ChannelSync™ Architecture for 130 fs matching between channels
- Multi-Lane eye, Jitter and Noise Analysis with SDAIII-CompleteLinQ
- Optical Modulation Analysis with Optical-LinQ
- PAM4 Eye, Jitter and Noise Measurements with PAM4 Signal Analysis
- Industries only true hardware 14.1 GB/s serial trigger

LIGHTWAVE INNOVATION AWARDS

R&D 100

Distributor

TANGENTTEST

TANGENT TEST TECHNOLOGIES

Bangalore Head Quarters : No. 528, 2nd Floor, 8th Main, 6th Stage, BEML Layout, ITPL Road, Bangalore - 560 066. Phone: 080-40936722 /922 Fax: 080-40936322
Hyderabad : Flat No. 302, Bliss Apartments, H.No. 1-4-6, Street No. 7, Habsiguda, Hyderabad - 500 007 Tel/fax: 040-40147045
Chennai : Plot No. 990, 'H' Block, 2nd street, 11th Main Road, Anna Nagar, Chennai-600 040 Phone: 044-4218 0909 / 26160146
Email: sales@tangenttest.com Web: www.tangenttest.com

RF test equipment buyers in India

From private manufacturers who make amplifiers for cable TVs to large organisations like ISRO, DRDO, Intel, TI or STMicro, customers working on a variety of latest or cutting-edge technologies are buyers of RF test equipment. For example, ISRO and DRDO, who design satellite transponders and electronic warfare systems, respectively, require sophisticated and accurate instruments. Small- and mid-level manufacturers prefer cost-effective, multi-featured test equipment.

Pricing trends. Pricing trends vary depending on the market segment. For example, customers working on aerospace and defence-related applications or emerging wireless standards are ready to pay premium price for novel equipment. However, customers using general-purpose RF equipment are sensitive about their bottom-line performance. For such applications, prices of tools are decreasing. There is a higher requirement for cost-effective test solutions.

—Vishal Gupta, senior application consultant (RF/MW, Surveillance), Keysight Technologies

Fig. 6: HL2202 high-speed signal path analyser, which costs US$ 7495 (Image courtesy: www.hyperlabsinc.com)

The simple and intuitive UI allows engineers to generate and complete the test report on-site, also allowing them to Geotag each test point and place a snapshot of Google Maps directly into the report.

Analysing signals in RF designs in a budget-friendly manner

Engineers typically measure the performance of RF and microwave devices by considering S parameters, or, in other words, network scattering parameters. A vector network analyser (VNA) is usually employed to ensure that the RF design of the circuit is developed to present the best performance. It would be safe to assume that VNAs are crucial for RF design engineers, but there is a new, budget-friendly device in the market that looks to replace VNAs for most common applications.

Engineers do not make use of the entire spectrum of a VNA for common signal verification applications including cable testing, which are usually expensive. In such cases, relevant test can be performed on HyperLabs' signal path analysers (SPAs). This instrument measures the vital parameters influencing the course of a signal through PCB trace, high-speed interconnect or cables.

S parameters, namely, return loss (S11) and insertion loss (S21) measurement capabilities, are incorporated in the recently-launched versions, eliminating the need for a separate network analyser, which is not to be seen in the low-cost competing instruments.

Limited to 20 channels, this tool can acquire and analyse cross-talk, time-domain transmissometry (TDT) and time-domain reflectometry (TDR) data in systems. Using the software, an engineer can also obtain voltage, impedance and other normalised readings in time-domain and frequency-domain. See Fig. 7 to see a comparison in the performance of a VNA and an SPA.

Spoting and fixing signal interference issues

The increasing use of Centralised Radio Access Network (C-RAN) architecture, macro cells, distributed antenna systems and small cells is propelling installation of fibre based remote radio units to attain high bandwidth and reduced inactivity.

Common Public Radio Interface (CPRI) and Open Base Station Architecture Initiative (OBSAI) protocols are extensively used in such environments. It has become even more important for technicians and engineers to identify and resolve signal interference issues swiftly not only from conventional mobile sites, but even modern sites that employ

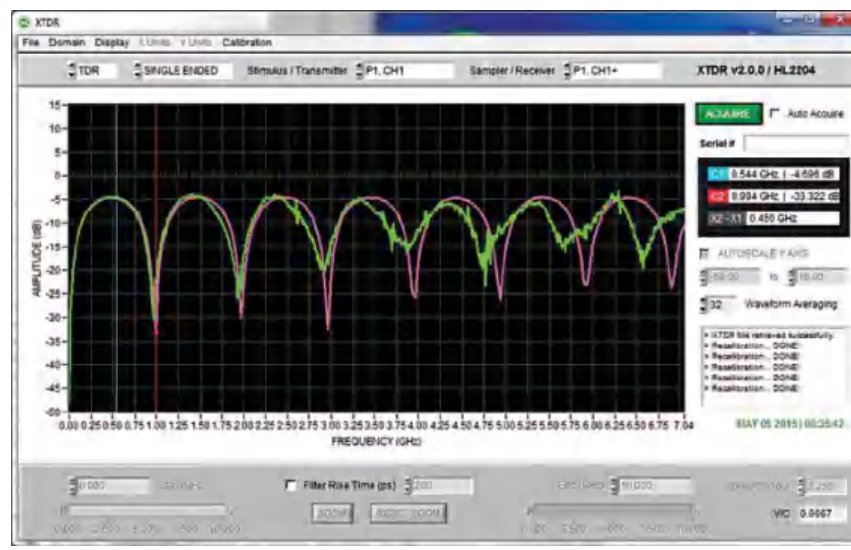


Fig. 7: Comparison of S11 (return loss) measurements taken by XTDR and HL2204 (green trace) versus those taken on a much more expensive VNA instrument (pink trace) (Image courtesy: www.everythingrf.com)

fibre links between the baseband station and remote radio units.

By adding RF over OBSAI (RFoO-BSAI) analysis components to its CellAdvisor products, JDSU allows technicians to point out and rectify interference. Two core technologies, RFoOBSAI and RfoCPRI, record and analyse RF metrics. To ensure end users experience top-notch mobile service, engineers locate interference by capturing and analysing RF elements from mobiles (uplink) as well as radios (downlink). CellAdvisor base station analysers perform fibre, mobile phone signal analysis, CPRI, cable, interference and OBSAI tests on a single instrument.

Vendors creating engineer-friendly tools

We have been seeing greater use of smartphones in testing for some time, but the roles these play have been increasing steadily. Once this blends in with cloud services and analytics, we might see the sort of disruption here that we saw the Internet of Things (IoT) do to the consumer world.

While some consider the IoT to be like a tech revolution, others like to think of it as old wine in a new bottle; some even say the wine blend has gotten better and cost-effective over the years.

Whatever floats your boat, the IoT sure seems to be catching up in almost every segment including test and measurement (T&M). Many T&M vendors are making the current generation of tools for testing engineer-friendly RF designs by integrating mobility, connectivity and features depending on the current set of market requirements. ●

Incoming: T&M solutions for 5G wireless communication systems

With an aim to launch 5G commercial services in 2020, NTT DOCOMO recently joined hands with Keysight Technologies for development of next-generation 5G wireless communication systems. 5G's performance will be addressed with enabling multiple technologies including new air-interfaces, massive multiple-input multiple-output (MIMO), ultra-broad bandwidths and mmWave frequencies. Keysight also recently introduced the 5G channel sounding reference solution designed for promoting advanced research of mmWave 5G channel models.

Among the mobile broadband requirements of 5G are new technologies generating over-the-air data rates as high as 10Gbps, as cited in a press release from Keysight. To meet these requirements, new air-interfaces are being developed to function in frequency bands from 10GHz to 100GHz. The 5G channel sounding reference solution allows researchers to distinguish the channel behaviour in these frequency bands and empower them to develop necessary channel models for designing and validating air-interface alternatives.

Signal Generators: Slow-Paced Technology

Anagha P. is a technical correspondent at EFY

There are certain instruments that you are bound to find in an electronics lab. A signal generator is one such essential test and measurement (T&M) device; others being a multimeter, power supply, an oscilloscope and so on. Let us go into the details of what is new in this commonly-used instrument.

We have observed that the classification of signal, function and waveform generators is often misunderstood. Let us clarify that first before moving forward.

Signal generators can be broadly classified into two categories: function generators and arbitrary waveform generators (AWGs).

Function generators. These are used to generate simple, periodic waveforms like sign, square, triangle and sawtooth.

AWGs. These can create complex signals specified by users; these could be periodic or non-periodic and of any possible

National Instruments VirtualBench

Anritsu MG3710A

Keysight UXG Agile signal generators

Bird's-eye view on pricing factors

Demand for signal generators and their cost are mutually-related, says Manish Kwatra, chief executive officer, Metro Electronic Products. Traditionally, these instruments were limited to high-profile research and development (R&D) laboratories. But now we find at least simple function generators in school and college labs, electronics repair centres and so on.

Cost reduces over time. According to Madhukar Tripathi, senior manager - marketing and channel sales, Anritsu India Pvt Ltd, customers in India care less for features and functionality and prefer having devices that cost less. When the price of the device is less, more people start buying new instruments and upgrading existing ones. Kwatra claims that, on balancing out the time value of money, the cost of specific signal generator models from OWEN has reduced by 30 per cent to 40 per cent over a period of two years.

Explaining this process. The price of a standalone signal generator depends on its technical specifications. But due to the continuous evolution of technology and advancements in the T&M arena, value addition for an instrument would be less two years from now. Hence, the cost of that particular model also reduces significantly, explains Avichal Kulshrestha, technical marketing engineer, National Instruments (NI).

Benefit of modular instrumentation. According to Frost & Sullivan's report 'PXI Market to Change the Face of the Test and Measurement Industry,' dated August 19, 2014, open modular platforms such as PCI extensions for instrumentation (PXI) offer high speed of measurement, lower power consumption and flexibility, and reduce redundant components in a test system, thereby bringing down time-to-market and the overall cost of tests.

All-in-one instruments cost less. A notable reduction in cost is happening with the integration of multiple instruments into a single all-in-one device, adds Kulshrestha. Examples are NI VirtualBench and Tektronix MDO3000, which have price tags less than the sum total of the cost of equivalent standalone models.

Offering high-priced models. India is a very price-sensitive market. Customers are sceptical about buying costly signal generators even if these offer new and improved functionalities required by the user. How do manufacturers and distributors face this issue? Tripathi points out that, giving attractive premium rates for newly-launched products would help to an extent.

TABLE I
Latest Instruments in the Last One Year

Instrument	Model	Manufacturer	Features
All-in-one	VirtualBench	National Instruments	• Contains a mixed-signal oscilloscope with protocol analysis, digital multimeter, function generator, programmable DC power supply and digital I/O • Connects display via existing Wi-Fi network or directly to a network hosted by VirtualBench • Small form factor of 254×190.5×73.5mm
All-in-one	MDO3000	Tektronix	• Contains a mixed-domain oscilloscope, spectrum analyser, logic analyser, protocol analyser, digital voltmeter and an arbitrary function generator • Completely customisable; enables customers to select the functionality and performance, and is fully upgradable
All-in-one	WaveSurfer 3000	Teledyne LeCroy	• Contains an AWG, a protocol analyser and digital voltmeter • CAN and LIN trigger and decode capabilities help analyse and debug automotive systems using CAN and/or LIN serial data communication standards • Enables import of .csv files to recreate analogue waveforms
Arbitrary waveform generator	AG4151	OWON	• Maximum 150MHz frequency output • Up to 400MSa/s sample rate and 32-bits frequency resolution • Vertical resolution: 14-bits, up to 1M arbitrary waveform length • Sine, square, ramp, pulse, noise, sinc, exponential rise and decay, 32-channel digital waveform, DC and user-defined arbitrary waveform
Arbitrary waveform generator	AG1022F	OWON	• Maximum 25MHz frequency output • 125MSa/s sample rate, and 32-bits frequency resolution • Vertical resolution: 14-bits, 8K arbitrary waveform length • Sine, square, pulse, ramp, noise, exponential rise, exponential fall, sin(x)/x, step wave and others, total 26 built-in waveforms and other user-defined arbitrary waveforms
Arbitrary waveform generator	AFG1022	Tektronix	• Dual-channel, 25MHz and up to 10 Vp-p output amplitude • Four run modes, 50 built-in frequently-used waveforms and built-in 200MHz frequency counter • Targets education field and entry-level testing
Vector signal analyser with vector signal generator (optional)	MS2830A	Anritsu	• Supports multi-function vector signal analyses in both time and frequency domains • Power consumption of 110VA minimum • Also supports an analogue signal generator, audio analyser and modulation analysis
Vector signal generator	VSG25A	Signal Hound	• Weighs 130gm and fits into a pocket • Frequency range of 100MHz to 2.5GHz, output amplitude from -40dBm to +10dBm and 100MHz of modulation bandwidth • Supports modulation for BPSK, QPSK, DQPSK, OQPSK, π/4 DQPSK, 8PSK, 16PSK, 16QAM, 64QAM and 256QAM protocols
Vector signal generator	TSG4100A	Tektronix	• VSG at an affordable RF signal generator price • Easily upgraded in the field for more advanced vector- and digital-modulation capabilities • Targets product design, testing and manufacturing
Vector signal transceiver	NI PXIe-564X	National Instruments	• Vector signal analyser (VSA) and generator in a single module • 65MHz to 6GHz frequency range, up to 200MHz instantaneous bandwidth • 24 channels of high-speed digital I/O up to 250Mbit/s

shape. The bandwidth of AWGs is usually limited compared to function generators due to the complex techniques used to generate these signals.

Sophisticated signal generators are also divided into the following categories based on their application:

Audio frequency (AF) signal generators. These are optimised for use in AF range of 20Hz to 20kHz and above, and are used for measuring distortion and checking frequency response in audio equipment.

Radio frequency (RF) signal generators. These are used to generate RF signals and are generally used in design and test applications in the RF range, particularly telecommunications.

Vector signal generators (VSGs). These are basically RF signal generators with advanced modulation formats for complex waveforms.

Pulse generators. These produce output in the form of pulses of logic 1s and logic 0s with different analogue characteristics such as rise time, fall time and delays.

When these create mere pulses without controllable parameters, these are known as logic generators. These are used to generate pulses that stimulate logic circuits.

Technology trends

In April 2015, an article published on *Electronics B2B (electronicsb2b.com)*, titled 'Higher efficiency rates and customisation options driving signal generator market,' mentions the trends in the signal generator industry as:

Customisation. The instrument can be customised based on application requirements.

Compactness. Developers are trying to shrink the size of the device without compromising on the effectiveness of measurements.

USB interfaces. These make the instrument compatible with various devices to be tested and enable seamless transfer of data.

Support for communication technologies. The gadget has to support

all major communication standards so that it is convenient for users.

What more has come up since then?

Newer standards and modular upgrade options. The signal generator market has not witnessed revolutionary changes in the past few years. Hence, the release of new models or upgraded versions of particular instruments depend mainly on the changes brought about in testing standards.

Other changes seen in new models are widened specification range and enhancement of existing features. With the introduction of modular platforms, the upgradation of an instrument has become much easier for both manufacturers and users.

FPGA onboard. There are applications where data is required to be processed at a very high rate without any lag or loss of information. Field programmable gate array (FPGA) is a hardware based processor that processes incoming data on a point-to-point basis, unlike software based processing that requires buffering. This means, the user gets immediate response and high processing frequency as there is no buffer time and overhead time involved. Such FPGA processors are used in many modular platforms available these days.

Increased demand for specialised signal generators

On speaking to the spokespersons for this story, it was felt that the niche market for signal generators is going somewhat steady.

Education. Every electronics lab in an educational institution has at least one simple, low-frequency function generator for performing basic electronics experiments. With a large number of engineering colleges being set up every year, academia is one area where signal generators are being sold in good numbers. These usually generate the basic sine, square and triangular waves at a frequency that ranges from a few hertz to a few gigahertz. The user interface (UI) for these academia-focused instruments is simple to understand and operate.

Defence R&D. The purchase of high-frequency signal generators that can create custom signals generally comes from defence and aerospace development laboratories such as Defence Research & Development Organisation (DRDO). They also use pulse-signal generators for radar application.

Semiconductor. Many semiconductor firms such as Freescale, Intel, Qualcomm and Texas Instruments perform their chip design validation in India. Whether to check logic high and logic low of a chip, or to analyse the equivalent analogue output for a digital input, a signal generator is important.

Purchase of signal generators is notable in telecom (due to the continuously-evolving communication standards), light emitting diode (LED) lights and drivers manufacturing, and electronic device repair shops, among others.

Influenced by indigenous manufacturing

Signal generators are instruments that have not evolved much over the years, except for the introduction of modular platforms. Though customers working on advanced applications opt for a broader range of parameters or integrated instruments, basic models of signal generators are still in demand.

With the launch of 'Make in India' campaign and push by central and state governments for indigenous manufacturing, manufacturers and distributors are hoping that five years down the line, the signal generator market would see significant growth in revenue. ●

MAJOR CONTRIBUTORS TO THIS REPORT

Adesh Kumar Jain, application engineer, Keysight Technologies India Pvt Ltd

Avichal Kulshrestha, technical marketing engineer, National Instruments

Madhukar Tripathi, senior manager - marketing and channel sales, Anritsu India Pvt Ltd

Manish Kwatra, chief executive officer, Metro Electronic Products

Naresh Narasimhan, country marketing manager, Tektronix India Pvt Ltd

TABLE II
Various Manufacturers and Distributors

Manufacturer	Partner/Distributor
Anritsu	Anritsu India Pvt Ltd Meera Agencies Pvt Ltd Optimized Solutions Ltd Peridot Technologies Scientech Technologies Pvt Ltd Sinetec Automation
Keysight	Keysight Technologies India Pvt Ltd
OWON-MetroQ	Metro Electronic Products
National Instruments	Captronic Systems Pvt Ltd Digilogic Systems Pvt Ltd National Instruments India NexGEN Consultancy Pvt Ltd Optimized Solutions Pvt Ltd
Tektronix	Aarjay International Pvt Ltd Convergent Technologies Cyronics Instruments Pvt Ltd Optimized Solutions Pvt Ltd Peridot Technologies Primetech Instruments Pvt Ltd RS Components & Controls (India) Ltd SPI Engineers Pvt Ltd Techno Scientific Co. Tektronix (India) Pvt Ltd Vishal Vyapar Vikash Vitronics (India)

LCR Meters & Impedance Analyzers

HIOKI
EE Corporation, Japan

High-speed, 1mHz to 300MHz Measurement Frequency to Meet All Applications

The new standard

LCR Meter that brings exceptional specifications and cost performance to a wide range of applications, from R&D to production lines

Made in JAPAN

IM7580
Impedance Analyzer
High Frequency 1MHz to 300MHz
with Equivalent Circuit Analysis

World's fastest
300 MHz
LCR Meters & Impedance Analyzers

IM3536

LCR Meter
General-Purpose LCR Meter with Measurement Frequency from DC, 4Hz to 8MHz

IM3533

LCR Meter
General-Purpose LCR Meter for Lower Frequency Testing of 1mHz to 200kHz

Distributor

TANGENTTEST

TANGENT TEST TECHNOLOGIES

Bangalore Head Quarters : No. 528, 2nd Floor, 8th Main, 6th Stage, BEML Layout, ITPL Road, Bangalore - 560 066. Phone: 080-40936722 /922 Fax: 080-40936322
Hyderabad : Flat No. 302, Bliss Apartments, H.No. 1-4-6, Street No. 7, Habsiguda, Hyderabad - 500 007 Tel/fax: 040-40147045
Chennai : Plot No. 990, 'H' Block, 2nd street, 11th Main Road, Anna Nagar, Chennai-600 040 Phone: 044-4218 0909 / 26160146
Email: sales@tangenttest.com Web: www.tangenttest.com

What's New in EDA Tools

Abhishek A. Mutha is a senior technical correspondent at EFY

Electronic devices manufactured today are far more complex than were five years ago in terms of processing power, power consumption, memory, area and performance. To keep up with the market demand for higher bandwidth, more memory and lower power consumption in electronic products, electronics design automation (EDA) companies are rolling out valuable features in their range of software tools for designing electronic chips and systems in a faster, better and cost-effective manner.

EDA tools are also moving to a secure cloud environment, which could lower capital and operation expenditure. More on that and other interesting developments in EDA tools in the following sections.

Tools for system-level design

With the proliferation of the Internet of Things (IoT), an open, connected and scalable software tool can be used by developers to accelerate system-level design and verification. Many EDA companies provide comprehensive tools that provide high throughput and quick debugging and compilation. They are also adding new features to boost ease of use and adaptability of the software.

New features in some of the tools for system-level design and verification have been highlighted below. These allow engineers to execute design optimisations swiftly and effectively.

SystemVue. System architects, designers and verifiers mostly use electronic system-level design (ESL) tools to innovate the physical layer (PHY) of next-generation communication systems. It is important to have the right tool to design and validate the PHY layer of communication systems that simplifies this challenging task.

Usually ESL tools iterate the baseband and radio frequency (RF) designs separately in a system. Keysight's SystemVue validates the entire system at an early stage and then co-verifies it at each step in the process. Common test benches are reused throughout the model based design flow, which reduces design time and verification effort.

The latest release, SystemVue 2015.01, includes a module from MathWorks, MATLAB Script, which replaces mathlang equation parser in earlier versions. Equipped with locally-licensed copies of MATLAB, this module executes MATLAB models from within SystemVue. With updates to almost all libraries and add-ons, a new 5G library has also been incorporated. Instrument support and simulation have been expanded for wide bandwidth systems, especially for radar, 5G and satellite.

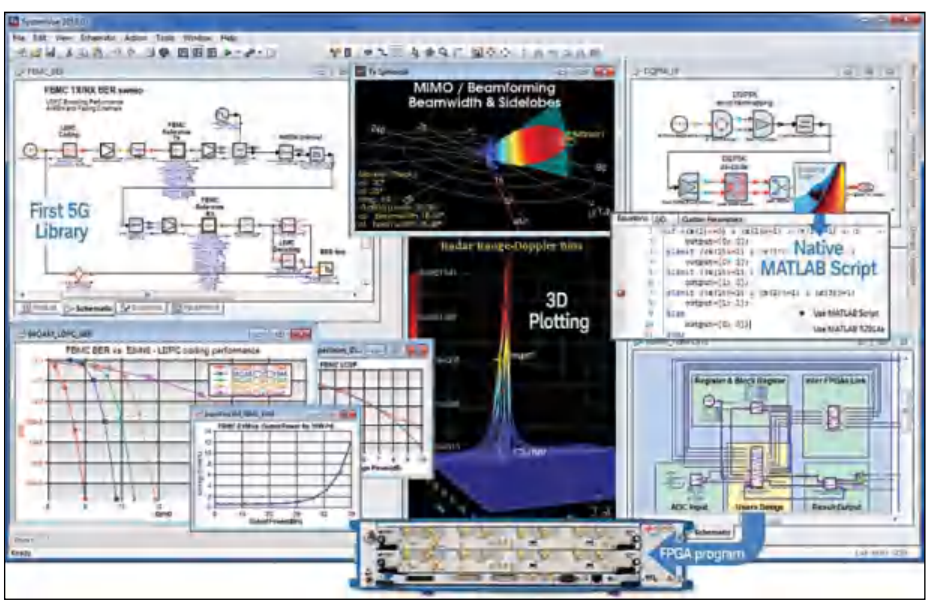


Fig. 1: Interface of SystemVue 2015.01 showcasing its latest improvements and additions (Image courtesy: www.keysight.com)

Another key feature included is a field programmable gate array (FPGA) programming interface for the M9703A real-time digitiser.

IDesignSpec. Modern systems on chips (SoCs) are quite complex and include a lot of

Fig. 2: Simulink features new graphical controls and displays for tuning the simulations (Image courtesy: www.in.mathworks.com)

functionality. Specifically speaking, Rinku Singh, design engineer, Agnisys says, "Register and memory-map definitions are becoming tedious, consuming significant implementation and verification time." Agnisys' IDesignSpec helps designers to capture register specification and generate the desired code.

Engineers manually read the specification and code RTL or C header files, which is highly undesirable as it is tedious, mundane and costly in terms of both time and resources. In the latest version, IDesignSpec automates this process of generating code from a single specification. The specification itself may be split over a number of individual documents or files.

"Agnisys recently launched Automatic Register Verification (ARV) module, where two separate tools (IDesignSpec and IVerifySpec) are available in an integrated form," notes Singh. He adds, "IDesignSpec generates Universal Verification Methodology (UVM) environment and custom sequences, whereas IVerifySpec generates the verification plan, imports

Latest in system-design software: A bird's-eye view

SystemVue. SystemVue 2015.01 integrates MATLAB Script, FPGA interface to Keysight M9703A, 3D plots and a new 5G library

IDesignSpec. Automates the process of generating code from a single specification. IDesignSpec and IVerifySpec are available in an integrated form in ARV module

Advanced Design System (ADS). New W2309 double data rate (DDR) bus simulator, silicon RFIC interoperability with Virtuoso enhancements, two to 16 times faster FEM simulation performance, GoldenGate-in-ADS and new RFIC cockpit

Now, chip-design tools on cloud help design quickly, efficiently and cost-effectively

IBM is now offering its EDA suite of chip-design tools stored on its own SoftLayer cloud infrastructure, providing on-demand access to designers. IBM's high-performance services for EDA are made available through SiCAD, a silicon based platform provider. Targeted at development of mobile phones and wearable devices, this move could boost designing in small and mid-level companies.

Supporting a pay-as-you-go model instead of contract with EDA vendors, IBM claims it will reduce the cost of developing a new integrated circuit (IC) by 50 per cent. Three tools, namely, Logic Verification tool, Spice simulator and Library Characterisation tool offered in the first phase cover nearly 70 per cent of a typical new IC design flow today. In future, IBM plans to add more tools to cover at least 90 per cent of the flow.

Latest in verification software: A bird's-eye view

MATLAB. Big Data enhancements (allowing Big Data analysis on desktop), new hardware support and integrated documentation for custom toolboxes

Simulink. Dashboard block library, Bus Smart Editing Cue, algebraic loop highlighting, Simulink project sharing, fast restart and simulation stepper for accelerated models, consistent data support for testing components and Simulink package for Apple iOS devices are some improvements

LabVIEW. Implemention of a local human machine interface (HMI) with embedded UI support, Ethernet over USB connection for simplified target configuration, debugging and maintenance, real-time trace viewer, USB 3.0 support and 12-core CPU support on Phar Lap ETS targets

Innovus. First massively-parallel implementation solution in the industry that supports advanced 16nm/14nm/10nm FinFET and established process nodes

Latest in PCB designing tools: A bird's-eye view

OrCAD. Static phase differential pair constraints, minimum/maximum and relative propagation, heads-up displays and delay tuning. Productivity improvements include scribble route, group/contour routing and via arrays

PADS. Available in the cloud or on the computer, PADS Standard Plus can be used for basic PCB layout needs and PADS Professional, which utilises Xpedition technology; can be used for schematic design, layout, constraint management, analysis, FPGA-PCB co-design, project data management and manufacturing prep in the most demanding and complex designs

CADSTAR. Contains across-the-board performance enhancements and design-efficiency features. CADSTAR's Design Editor now allows items to be modified within a group. P.R.Editor Move tool in Activ-45 has been enhanced to use the pusher and spring-back engine

CR-8000. Engineering Desktop design portal enhancements, single product handling, hierarchical design and block reuse are some of the additions in the latest version

the existing plan, simulation vendor specific plans and annotated simulation results on to the plan."

There are some features that were earlier optional for users to use, but in the latest version these work as default. Singh informs, "Tool Command Language Application Programmer's Interface (TCL API) was optional in an earlier version, but it is now included by default. It helps users create their own outputs from the specification." He adds, "The latest version completely supports several industry-standard buses like Advanced eXtensible Interface (AXI), Advanced High-performance Bus (AHB), AHB3Lite, Open Core Protocol (OCP), Avalon and Wishbone. This ensures that users can create SoCs with ease."

ADS. The newest release of Advanced Design System (ADS) 2015.01 includes various improvements over the earlier version. This tool from Keysight Technologies typically covers the complete design flow of a product to manufacturing and is suitable for board, module and system designers.

Silicon radio frequency integrated circuit (RFIC) interoperability with Virtuoso enhancements provides designers with a schematic interoperable process design kit (PDK) as well as pcell support.

Improvements in finite element (FEM) simulation enable up to 16 times faster performance. There are also several layouts and layout verification improvements implemented in this version such as polymorphic interconnect modelling, layout interconnect design and faster layout viewing, to name a few.

Tools for system-level verification

Developers and integrators require verification tools to ensure that product specifications have been accurately tested and implemented. Using the latest in methodologies, new developments in verification tools look to increase the overall quality of the final product.

MATLAB and Simulink. Engineers today are using FPGAs for prototyping and algorithm acceleration. These can be realised with the help of system-level design and verification tools like MATLAB and Simulink, by quickly prototyping their algorithms on FPGAs.

In the latest release of MATLAB, many new features have been included. It comprises a new graphics system and capability to analyse Big Data on a personal computer, after which it can be scaled to Hadoop.

Engineers can also pack custom MATLAB toolboxes into a single, installable file, and manage and control code within the MATLAB desktop.

Simulink's recent update enables engineers to test simulations with intuitive graphical displays and controls. With Bus Smart Editing Cue, it is now possible to combine signals into a bus signal and select specific signals or the entire bus can be accessed.

Project sharing and collaboration has been made easier with a share option. Users can share projects via GitHub, MATLAB toolbox and email, which is currently limited to Windows operating system (OS) only. Simulink also extends support to Apple iOS devices. This allows developers to create an app, which runs Simulink algorithms and models on iOS platforms.

LabVIEW. Engineers use system design tools to simplify complexity and for efficient hardware integration. Selecting the right design tool is the key to reduce development complexity and costs. Another popular tool, LabVIEW, recently got an upgrade that enables engineers to build better embedded monitoring and control systems, and make insightful data-driven decisions.

LabVIEW 2014 has a variety of enhancements made. For instance, in block diagrams, it automatically creates a shift register when a user

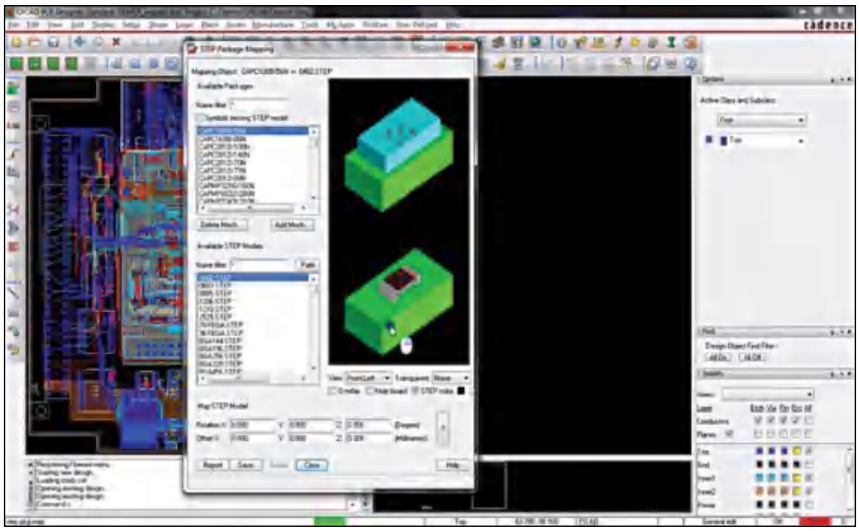


Fig. 3: It is now possible to map and link a 3D STEP model to the components in OrCAD PCB Editor (Image courtesy: www.orcad.com)

places For loop or While loop around the existing code.

For a particular case structure, it is now possible to replace an input tunnel with the case selector. Earlier, DataPlugins were to be downloaded manually and installed, whereas in the latest version, one can directly search, install and update DataPlugins.

There have been other enhancements to LabVIEW environment, application builder, Web services and front panel as well.

Innovus. Increasingly, developers are turning to hardware/software

New tools for enabling IC design: A bird's-eye view

Socrates. ARM Socrates DE standardises, configures and integrates IP with ARM IP to create an SoC

Calibre xACT. Parasitic extraction platform that addresses a wide spectrum of analogue and digital extraction needs, including 14nm FinFET, while minimising guesswork and set up efforts for IC designers

Some interesting open source EDA tools

Despite the fact that the big three reign supreme in EDA, given below are some interesting and useful open source EDA tools:

gEDA. This suite consists of various EDA tools that are mainly used for schematic capture, simulation, circuit design, prototyping and production. It was introduced when there was a lack of free EDA tools in the market. It is mostly used for creating professional-quality designs of low- and mid-level complexity.

KiCAD. This tool is used for designing schematics and converting these into PCB layouts with up to 32 copper layers. It includes three main tools; Gerbview is for viewing Gerber files, Eeschema is a schematic editor and Pcbnew is a PCB editor with a 3D viewer. KiCAD runs on Linux, Windows and Apple OS X.

Electric. Electric software can handle many forms of circuit design, including textual languages (such as VHDL and Verilog), schematic capture (digital and analogue) and custom IC layout.

Some other tools. XCircuit is used for publishing quality circuit schematics, Fritzing can be used for creating layout and manufacturing professionals PCBs and Quite Universal Circuit Simulator (Qucs) provides the ability to create a GUI and perform simulations on the circuit. FreePCB is a Windows platform based tool for creating layouts and exporting designs in Gerber format. Unlike KiCAD, it allows up to 16 layers only. Magic is considered as an easy-to-use tool for circuit layout and is widely used by start-ups, small companies and some universities.

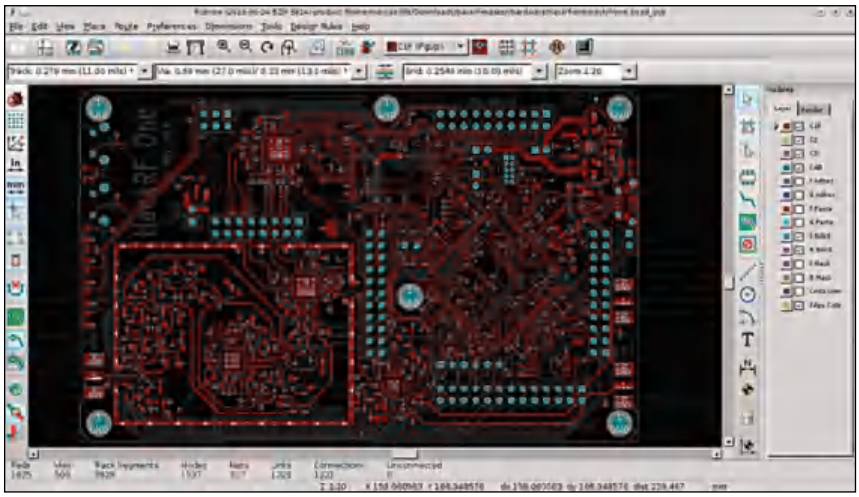


Fig. 4: KiCAD, a continuously-developed open source platform, can be used to create schematic diagrams and PCBs up to 32 copper layers (Image courtesy: www.kicad-pcb.org)

co-design and co-verification, concurrently designing and verifying hardware and software components of the system design, to deliver on more demanding time-to-market requirements, observes Vishal Abrol, senior group director, Field Engineering, Cadence Design Systems (India) Pvt Ltd. He says, "Concurrent design and verification allows for software development to begin before silicon is available, often before it is frozen, which can shave months off the software development schedule."

Launched in March 2015, Innovus Implementation System is for system companies that are working on complex, advanced node designs and face conflicting challenges around meeting requirements for power, performance and area (PPA) as well as turn-around time (TAT).

Abrol says, "It becomes very difficult to achieve the best power performance with maximum productivity without compromising the outcome of either of these requirements. Innovus Implementation System provides a typical 10 to 20 per cent production-proven advantage in the PPA of the design, along with an up to 10 times TAT and capacity gain."

He adds, "The platform is the industry's first massively-parallel implementation solution. It is built on a next-generation platform with several integrations that result in an easy-to-use core implementation and sign-off flow that facilitates better engineering productivity."

Tools for board-level design

For every electronic product, a printed circuit board (PCB) is like its central nervous system, mechanically supporting it and electrically connecting electronic components mounted on the board. And, designers look to create a PCB that is competent in the first run. Therefore it is of paramount importance to design quality PCBs with the help of standard design tools in an efficient and cost-effective manner.

Tools in the market that look to tackle most of the complex design challenges and latest developments in some of these tools for board-level designing are featured below:

OrCAD. In July 2014, Cadence introduced three new additions to its OrCAD product line to accelerate the mainstream PCB design process and provide a significant boost to productivity and efficiency.

Abrol says, "The new OrCAD products include OrCAD Engineering Data Management (EDM), a comprehensive collaboration and management environment for OrCAD Capture; OrCAD Library Builder, a rapid automated part builder; and OrCAD Documentation Editor, an intelligent, automated PCB documentation environment."

PADS. Acquisition of PADS has strengthened Mentor Graphics' tools for board-level design. Recently in April, Mentor Graphics released three new tiers of the PADS offerings—PADS Standard, PADS Standard Plus and PADS Professional.

Standard and Standard Plus versions have the same graphical user interface (GUI) as the earlier versions to make it easier for the user to switch and adapt. These suites have been enhanced with additional capabilities to incorporate design archiving, common constraint management, integrated design and additional analysis capabilities.

But PADS Professional version has a completely different GUI as it is built on Xpedition design technology from Mentor Graphics. It is targeted at professionals who require more power and capabilities for highly-complex designs.

Later in the year, a 2D/3D co-design solution will be introduced along with other new features.

CADSTAR. The latest version of this single-board design tool from Zuken enhances design efficiency to meet the requirements of today's high-speed designs, as well as routing functionality and group handling with its new features. Items contained within a group can be selected and modified without first ungrouping these, which was not possible earlier. This simple improvement will provide users with more time to focus on their designs and improve design quality as ungrouping items

poses a risk of regrouping these into a different configuration, informed Jeroen Leinders, CADSTAR worldwide sales manager, in a release.

Now, it is also possible to enter exact length and coordinate values while creating shapes in CADSTAR design editor, resulting in time saving and ease of use.

Place and Route (PR) editor supports impedance balanced routing, which accelerates implementation of high-speed interfaces.

CR-8000. CR-8000 2015 aims at empowering team collaboration for single-board and multi-board designs. In this version, combination of IC packaging and 3D multi-board design enables design teams to make products faster with a lower occurrence of design errors.

CR-8000 System Planner has enhanced module based and hierarchical system design capabilities, making it straightforward for engineers from all over the world to contribute to system design.

Today, reuse is an important part of the design process. Design Gateway allows constraints design and reuse by multiple team members. To support global standards, this software tool now creates output to IPC-2581B standard.

Chip design

Apart from updates to existing tools, there are some new software on the block, too.

Socrates. ARM recently launched a software suite that aims to reduce the SoC integration time from months to days, thereby simplifying and accelerating system integration. Socrates design environment (DE), one of the tools in the package, can be used by designers to standardise any semiconductor intellectual property (IP) into IEEE1685-2009 standard, making it integration-ready.

Apart from enabling IP standardisation, Socrates also allows automated, intelligent and fast IP integration. To ensure that the system is feasible, this tools runs design rule checks, also enabling designers to visualise each stage of the design.

CoreSight Creator, CoreLink Creator and AMBA Designer are the other tools that are part of this software suite.

Calibre xACT. With the aim to reduce set up efforts and trial and error methods for IC designers, this new addition to Mentor Graphics' Calibre software suite takes care of a wide range of analogue and digital extraction requirements, including 14nm fin-shaped field effect transistor (FinFET).

IC designers working at advanced nodes face quite a lot of challenges with these smaller nodes like extracting inductive, capacitive and resistive values of a design. This new parasitic extraction platform also works with Synopsys' and Cadence's verification and physical design software. The newest IC processes can achieve better accuracy with Caliber xACT's ability to use a single-rule deck for a variety of extraction applications, and faster performance and TAT without having to manually alter their tool's configuration.

With growing demand, open source could dominate EDA, too

Open source is everywhere—in majority of programming languages, integrated development environment (IDE), OSes and everyday tools. But open source tools have not yet penetrated the EDA domain (especially for synthesis and simulation) in the same manner as these have in other arenas. The reason could probably be the size of the EDA industry and users of EDA tools.

Another reason could be the lack of software developers designing EDA tools. Also, there are three major companies, Mentor Graphics, Synopsys and Cadence, which provide competitive software. If there exists a strong, growing need for open source EDA software by design engineers, then that demand should drive developers to improve the quality of these open source tools in the future. ●

Taking Indian Innovations to a Global Scale: Challenges and Solutions

Anagha P. is a technical correspondent at EFY. This article was written with inputs from Ian Hennell and Shinto Joseph, during an interaction at Embedded Safety and Security Summit (ESSS) 2015, Bengaluru

Over the last few years, numerous interesting researches and developments have come from India. If you look at the market today, you will find a lot of young entrepreneurs creating a wave of start-ups in India and coming up with innovative products and solutions. It is also good to see tech giants such as Intel, Mahindra, National Instruments (NI), Tektronix and Texas Instruments (TI) promoting and providing incubation for developing these ideas into final products, starting at college level.

However, we also see that some start-ups fail to even take off. Only a few of them have reached the market and have made profit and a lasting impression. Indian designs hardly get recognised and accepted like the ones coming from the world's top economies. Discussed below are some of the major reasons why this is happening, and how it can be solved.

Made in India, made for India

The Indian economy is different from other economies on the technology forefront. A large number of innovative ideas that come up here concentrate on assisting at grassroot levels, such as farming. It is difficult, or even pointless, to introduce such indigenous technologies to countries that do not match our living conditions and economies.

So, either the products should be made with a more universal appeal or should be targeted at markets that are at par with India.

Electronics design equipment

Expectations of developers

In today's world, innovation is not just about bringing up a breakthrough idea and a product. It is about creation of new economic value for this product and achieving its wide adoption and commercial success.

More often than not, Indian innovators are fascinated with increasing the functionalities and including exclusive features to the product they are developing. What they do not assess is whether the product would sell and in what kind of application areas a customer would get value addition, and if it satisfies regulation and safety standards.

After spending a lot of time and money developing the product, they start thinking about things like who will buy the product, how to sell it, how to get it certified and more. So they end up selling in Indian markets only and are unable to recover the cost without venturing out to international markets.

Quoting veteran scientist Dr Raghunath Anant Mashelkar, "In the field of innovation, India's image is bad across the world because of our tendency to have *jugaad*. This means getting less from less people. We bypass everything and somehow fix things. The idea of affordable excellence is what India needs to support."

Expectations of consumers

As previously mentioned, we find that some innovators try to add as many features as possible into a single product. But increased functionalities do not always excite end users. More integration generally affects the ease-of-use because system complexity increases with increased features.

Maintaining a simple user interface (UI) is a major factor that engineers should be

TOSHIBA
Leading Innovation

e-MMC™ .UFS NAND Flash Memory

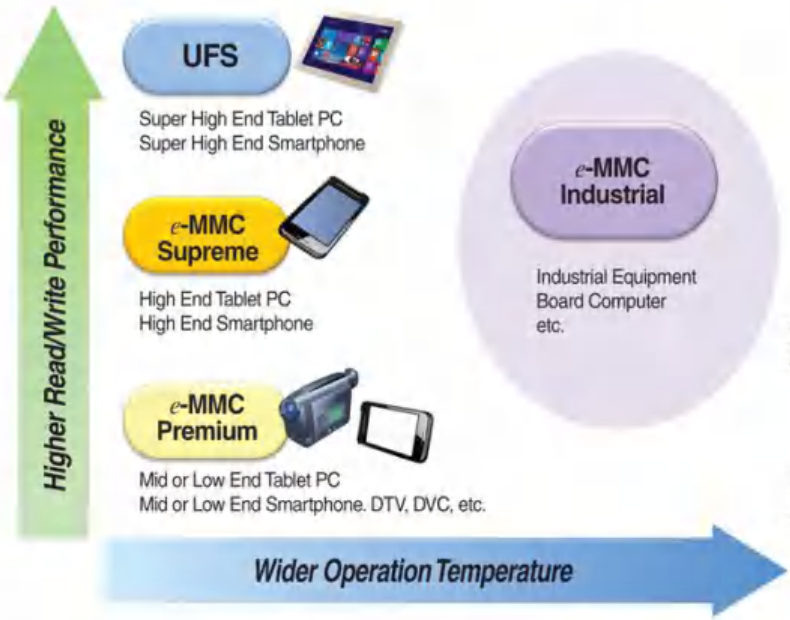
Toshiba's embedded MMC (*e*-MMC™), which is an industry-wide standard of storage media for mobile applications, has realized high performance and small form factor.

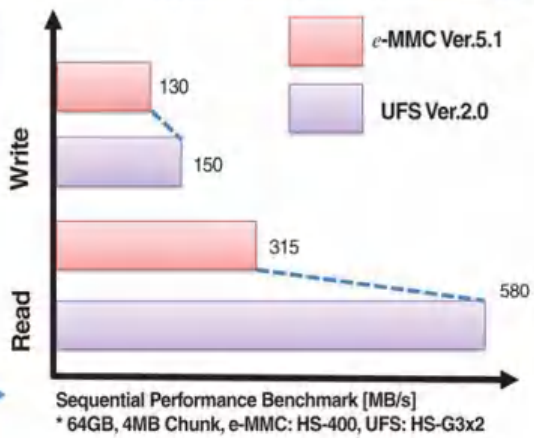
Toshiba is constantly innovating NAND flash memory (NAND) technology and developing UFS solution which is the next-generation mobile storage technology based on JEDEC UFS ver2.0 standard.

Feature

- The latest 15nm *e*-MMC generation which is compliant to JEDEC *e*-MMC ver.5.1 standard has been released to the market already. Higher performance and smaller form factor have been achieved
- Having a line-up of three categories of *e*-MMC products including *e*-MMC industrial, various market's needs can be satisfied.
- Regarding UFS which has very high performance, Toshiba also leads the market by shipping the world's first samples based on JEDEC ver.2.0 standard.

Toshiba UFS/*e*-MMC Categorization





Sequential Performance Benchmark [MB/s]
* 64GB, 4MB Chunk, e-MMC: HS-400, UFS: HS-G3x2

Toshiba Corporation
Semiconductor & Storage Products Company
http://www.semicon.toshiba.co.jp/eng/index.html

careful about, but sometimes they fail in keeping it simple and easy to understand from the consumer point of view. The product would not be successful if it is not implemented in a way the customers find useful and simple.

Another major area where innovators fail is pricing. Countries like India have a price-sensitive market, and unless the product has an affordable price point, and its design blends in with the ecosystem of the country, selling the product could be difficult.

Safety and security concerns

It is important to understand standard safety, security and regulatory requirements, and make sure that the end product satisfies this criterion. Engineers in India often fail to think through and probably do not know or do not even consider that.

Mashelkar said, "Somehow, in India, cost is the only consideration and not safety." If the product is not designed for safety and security, it cannot be certified, and unless it has relevant certifications, it cannot be sold in international markets.

When developers reach this stage, the only solution is to perform reverse engineering and find out what went wrong in the design, to find out where they breached the specification and safety standards and correct those. This requires time and money, further delaying the time-to-market and increasing the cost of the product. Hence, it is imperative to take care of the level of safety, security and reliability during the design stage itself.

Getting certified

Every field in electronics has a set of international standards. But of course, many countries have their own specific set of standards derived from international standards. This is because products developed in a foreign place would not always fit into every economy or lifestyle.

Some product development companies are going for international certifications and their variations with consultants coming in from countries like Germany, Italy or the USA. But this is very expensive. It is important to build that expertise with as much local resources as possible because in India, price matters.

Automation of software verification, standards compliance, certification and regulatory support are now available through software tool suites provided by LDRA, making the process easier and cheaper.

Developing a favourable ecosystem

Several big brands only own the brand name. Most components and sub-systems that go inside the final product are from different vendors. When setting up base in India and working in a supply-chain system, we need to have vendors who can make these available locally.

In today's scenario, India lacks this ecosystem. The only option for such firms is to import the sub-systems. This is not profitable for the brands as they only have assembly units here. Due to this, they prefer to not set base in India. So while we say that big players are not buying anything from India for their systems, when these players look at India, they do not find vendors who meet their criteria.

In order to successfully establish a manufacturing unit, vendor base has to develop and an ecosystem has to be built around it over the years, and this ecosystem should have the capability to become the right vendor for that industry. If we work on increasing the capabilities of indigenous companies and creating a good supply-chain model in India, products would not only sell in international markets but also become a part of major systems and programmes.

While coming up with schemes, the government is focussing a lot on skill building. Electronics associations and other technology players have been actively supporting this initiative. Our professional education system has also been encouraging students with college-level technology business incubation wings. Funding and other help are provided to assist students so they can develop their idea into a product and take it to the market. But we still have a long way to go in moving from an examination-oriented system to an application-oriented one.

Indian product developers have come a long way from avoiding risks, playing safe and preferring comfort zones to being adventurous, passionate and not afraid of failure. We already have the talent, capital, ideas and skill-sets. What Indian innovators and product developer companies require is a systematic process of innovation. Having well-structured processes should improve the rate of conversion of an idea into a successful product in the market. ●

> "Engineers in India are now open to changes and new ideas and are striving to think globally. If they are provided with the right education and skills, we can make India and Made-in-India brand stronger and take it international."
> — Ian Hennell, the US operations director, LDRA, the USA

> "It is high time that people realise that it is not only about designing a fancy product; equally or more important is to make it acceptable to a market from various angles."
> — Shinto Joseph, operations and sales director, LDRA India

HKTDC 香港貿發局

Messe München International

http://electronicasia.com

COMPONENTS ASSEMBLIES & PRODUCTION DISPLAY TECHNOLOGY SOLAR & PHOTOVOLTAIC

electronicAsia 2015

ufi Approved Event

13 - 16 October 2015 • Hong Kong Convention and Exhibition Centre

In conjunction with HKTDC Hong Kong Electronics Fair (Autumn Edition)

Real Business through Global Marketplace

- Nearly 600 exhibitors from 14 countries and regions
- Highlights: World of Display Technology, Key Components for Smart Devices and World of Solar
- Concurrent with "HKTDC Hong Kong Electronics Fair (Autumn Edition)", forming world's largest electronics marketplace

Reserve Your FREE Admission Badge!

For trade visitors, you can reserve your FREE admission badge through the following channels:

Mobile Info Site – visit hktdc.com/wap/ea/T119;

Smartphone Info Site – download HKTDC Mobile at iPhone App Store, BlackBerry App World or Google Play; or

Website – visit http://electronicasia.com/ex/08

Organisers :

HKTDC – HONG KONG TRADE DEVELOPMENT COUNCIL
Tel: +852 2584 4333 Fax: +852 2824 0026 Email: exhibitions@hktdc.org

MMI ASIA PTE LTD
Tel: +852 2511 5199 Fax: +852 2511 5099 Email: mmi_hk@mmiasia.com.sg

DISPLAY TECHNOLOGY

SOLAR

How to Select the Right Soldering/Desoldering Station

Abhishek A. Mutha is a senior technical correspondent at EFY

Engineers know the value of solid and reliable soldering and desoldering stations. From carrying out simple soldering tasks to repairing and reworking surface-mount technology (SMT) boards, integrated circuits (ICs) and multi-layer boards, these stations are handy tools to have for every design engineer, technician, hobbyist or electronic enthusiast. In this article, we take a look at some of the latest features in soldering and desoldering stations, while highlighting the important parameters to consider before buying these for your applications.

Different kinds of stations available

Usage of soldering and desoldering stations range from very minute straight-forward jobs to heavy-duty applications. Based on the requirement and application, different stations are available, varying in power consumption, temperature range, microcontroller (MCU) based control and other features.

Contact soldering stations are the most common and popular kind of soldering stations. Abhishek Rao, technical marketing manager, element14 India, says, "These have a built-in power supply unit, which, in most cases, ensures the galvanic separation between the power circuit and the heating element." He adds, "Voltage on the heating element can be adjusted using the power supply unit and the heating temperature can be changed accordingly."

Lead-free soldering stations are another category that is used to wire lead-free printed circuit boards (PCBs). These usually make use of lead-free solders and are not necessarily expensive. With many developed nations making regulations favouring lead-free soldering, these stations could come in handy for future applications. Rao says, "Lead-free soldering stations are specially designed for working with lead-free solders, which offer good reliability and good solderability."

Although, lead-free stations have their own share of cons such as requirement of extra heat to melt lead-free solder, which, in turn, affects the tip of the soldering iron. Most of the reputed manufacturers educate their buyers on ideal usage of lead-free soldering stations, which helps them maintain and extend the life of soldering tips.

Soldering stations are also packaged with different kinds of heaters. "Ceramic heaters, induction coil heaters and combination of heater, sensor and soldering tip integrated into one tool are some other variations in soldering stations," says V. Ramavallabhan, management and technical consultant, JVR Consultants.

Hot-air rework and desoldering stations are generally used for removing components from PCBs and re-soldering new ones. While rework stations are ideal for simple jobs, des-

Parameters to consider before buying a soldering station

Wattage and temperature control. The primary factor to consider while getting a soldering station is well-controlled soldering tip temperature. One should look for the temperature range one can set. Looking at the wattage of the soldering iron or pencil is also important. A soldering station with over 40W power would cover most applications.

Heat up time. For regular soldering, one wants the tip to reach the required temperature faster. To a certain extent, this is also related to the heat-recovery capability of the station. A station with slow thermal recovery may cause issues like cold solder joints.

ESD-safe design. Devices we deal with currently are more compact and usually more delicate than the ones that were used earlier. ESD damage accounts for a big portion of device failures during soldering. Sometimes even minor damages could lead to fail-leakage specifications. It is crucial to make sure that the unit has an ESD-safe design for long-term reliability.

Cost of soldering tips. It is advisable to be aware of soldering stations with expensive soldering tips as these are required to be changed often due to their daily wear and tear.

—Abhishek Rao, technical marketing manager, element14 India

Broad Range of Solutions for Power Conversion Designers

The power conversion market is constantly evolving, with a focus on increased efficiencies and higher integration.

The devices you used in your last power conversion design may already be old news. No matter which topology or approach you choose, Microchip can support your design with our comprehensive portfolio of Intelligent Power products, which covers the spectrum from discrete analog solutions to sophisticated and flexible power conversion using our digital signal controllers (DSCs).

The dsPIC® "GS" family of DSCs is optimized to provide full digital control of power conversion stages. Compensation loops implemented in software offer the ultimate in flexibility, enabling designs leveraging numerous topologies to be tailored for energy efficiency over widely varying load or environmental conditions. Complete reference designs for AC/DC and DC/DC power conversion are available to enable faster time-to-market and simplify designs.

India Sales Offices:
Bangalore (080) 3090-4444 • **New Delhi** (011) 4160-8631 • **Pune** (020) 3019-1500
Email: asia.inquiry@microchip.com

MICROCHIP

www.microchip.com/intelligentpower

Manufacturer: Tenma
Model: 21-10115 UK soldering station
Highlights: ESD safe, 150°C to 450°C range, computerised temperature calibration, heating element malfunction alert
Price: ₹ 6202 (as listed on *element14.com*)

Manufacturer: Hakko
Model: 150W, FX-838 soldering station
Highlights: 200°C-500°C range, 20 different tip shapes, auto-sleep function, auto-power shut-off, heavy-duty station for industrial applications
Price: ₹ 75,950 (as listed on *element14.com*)

Manufacturer: Soldron
Model: 878D multi-function ESD-protected hot air and iron digital rework station
Highlights: ESD safe, MCU based smart circuit design, sleep function to save energy.
Price: ₹ 5900 (as listed on company website)

Manufacturer: Weller
Model: WES51D soldering
Highlights: Wireless temperature lockout, ESD safe, new heater and sensor design, auto-shut-off feature, MCU-controlled station with LED display
Price: ₹ 16,075 (as listed on *element14.com*)

Manufacturer: Pluto
Model: 555 MC soldering station
Highlights: Alumina ceramic heater, auto-sleep function, 50°C to 450°C/180°C to 480°C temperature range, used for general/PV module soldering and high mass components
Price: ₹ 4500 (as listed on *snapdeal.com*)

oldering stations are mostly used for demanding reworks on PCB boards and are comparatively less expensive.

Rao says, "Hot-air soldering stations are optimum for professionals and hobbyists because these can be used for preheating components before removing or can be used to reflow SMT components such as dual inline packaging (DIP), small outline integrated circuits (SOICs), quad flat packages (QFPes) and other ICs."

Some well-known brands in India

- Ersa
- Hakko
- JBC tools
- Metcal
- OK International
- Pace
- Pluto
- Soldron
- Weller

Pricing

Pricing in the recent past has been going down making these more competitive. Generally, pricing may vary from US$ 50 to US$ 2000, depending upon features and usability. Soldering station prices range from ₹ 4500 to ₹ 25,000. Soldering and desoldering stations typically cost anywhere from ₹ 14,500 to ₹ 135,000.

"The new-age soldering station offers a digital display, digital calibration and password lock functions at a very competitive price. Wattage of the station, precision in temperature control, display of the system and reliability in after-sales support are some important parameters to be considered."

—Sumeet Jain, director, Sumitron

He adds, "Infrared (IR) soldering stations are the most progressive solution in soldering of complex elements. IR light helps prevent mechanical damage and overheating of components due to concentration of the radiation beam of the IR spectrum at focal point."

Interesting features and their benefits

Soldering and desoldering stations are a must have for all electronics professionals. Nowadays, all stations are electrostatic discharge (ESD) safe, Restriction of Hazardous Substances (RoHS) compliant and digital in nature, informs Sumeet Jain, director, Sumitron. He says, "The new-age soldering station offers digital display, digital calibration and password

ASTRONOMICAL TIMER ASSP

Energy management from dusk to dawn — automatically

Renesas ASSP device TIMR-IS1 is a digital IC integrating the astronomical calculator. The configuration input parameters for the astronomical function are configured via the input pins.

Built-in Astro function takes geographic location inputs from the provided switch inputs and calculates the Sunrise and Sunset timings for the entire Indian & sub-continents with 1204 cities.

Applications

Domestic applications: Gate Lights, Outside lights, Parking, Home Automation
Commercial Applications: Street Illuminations, Road Sign Illuminations, Shopping Center Illuminations (Luminous Signboards), Park/Garden Illuminations, Parking Illuminations
Others: Home Illuminations, Other illumination applications

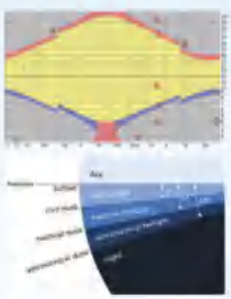
Technical Specifications

- Supply Voltage (1 Phase): 110 to 240 VAC
- Power Consumption (Max.): 4VA
- Battery Backup: Minimum 6 years running reserve
- LED Indication: Red LED for Relay Status
- Contact Arrangement: 1 C/O (SPDT)
- Contact Rating: 16A (NO) and 5A (NC) @240VAC/24VDC
- Incandescent Lamps: 1000 W
- Inductive Load (Cos o = 0.6): 6A @ 250VAC
- Clock Accuracy: Features RTC with built-in 32.768KHz DTCXO, High Stability (UB ± 5.0 x 10-6/-40°C to +85°C (Equivalent to 13secs per month deviation

Features/Characteristics

- Allows energy saving via Programming of time and geographical area of installation
- Random On Time Delay (up to 59sec) for street light mode
- Daily automatic regulation of sunrise and sunset time.
- Suitable to program the coordinates of the city through easy interface via dip switches
  - Latitude and longitude information is stored for 1204 cities – DIP switch 1
  - City can be selectable through dip switch – DIP switch 2
  - Off time can be programmable through dip switch - DIP switch 3 enabling energy management.
- Separate (RTC) clock battery is present can be programmable through UART
- Manual on/off is present
- Enabling energy management

Off time Setting - Dip S/w 3						
DAWN	-->	0	0	0	0	0
10 : 30	-->	0	0	0	0	1
10 : 45	-->	0	0	0	1	0
11 : 00	-->	0	0	0	1	1
11 : 15	-->	0	0	0	0	1
11 : 30	-->	0	0	1	0	1
11 : 45	-->	0	0	0	1	1
0 : 00	-->	0	0	1	1	1
0 : 15	-->	0	0	0	0	1
0 : 30	-->	0	1	0	0	1
0 : 45	-->	0	0	1	0	1
1 : 00	-->	0	1	1	0	1
1 : 15	-->	0	0	0	1	1
1 : 30	-->	0	1	0	1	1
1 : 45	-->	0	0	1	1	1
2 : 00	-->	0	1	1	1	1
2 : 15	-->	0	0	0	0	1
2 : 30	-->	1	0	0	0	1
2 : 45	-->	0	1	0	0	1
2 : 00	-->	1	1	0	0	1
3 : 15	-->	0	0	1	0	1
3 : 30	-->	1	0	1	0	1
3 : 45	-->	0	1	1	0	1
4 : 00	-->	1	1	1	0	1
4 : 15	-->	0	0	0	1	1
4 : 30	-->	1	0	0	1	1
4 : 45	-->	0	1	0	1	1
5 : 00	-->	1	1	0	1	1
5 : 15	-->	0	0	1	1	1
5 : 30	-->	1	0	1	1	1



Renesas Electronics India Pvt. Ltd.

Join us on Facebook

http://www.in.renesas.com

RENESAS

Tips to extend the life of soldering and desoldering stations

Handling soldering and desoldering stations in the right manner is important for extending their life. Here are some tips on how you can achieve this:

1. Validate each process of soldering and set to an optimum temperature, where a better-to-best soldering takes place. Avoid setting the highest possible temperature available in a soldering station.
2. Thermal shock to the solder tip can be detrimental. Avoid excess water in the cleaning sponge, which gives thermal shock to solder tips. This practice extends the life of the solder tip.
3. Do not tap the solder tip on the table or any hard surface.
4. Do not try to sharpen the tips by rubbing or grinding when these become blunt.

—V. Ramavallabhan, management and technical consultant, JVR Consultants

lock functions at a very competitive price." He adds, "One of the recent developments is the induction heating based hybrid soldering station. These stations use the benefits of both technologies, IR heating technology and convection, to bring out the best in soldering."

Hot-air stations are coming with built-in turbines for easy repair applications and heating processes such as shrinking. Brushless turbine is incorporated for ideal hot air flow such that hot air temperature is controlled electronically. Rao says, "Benchtop desoldering or rework stations have the most accurate temperature controls, best thermal recovery and additional features like programmable timing." Soldering stations come with Silver Line Technology soldering iron tips. These low-mass tips provide effective heat transfer via its silver core.

Unique closed-loop temperature control in some stations protects sensitive components. Most tips are available in three standard temperature ranges for maximum control. Ferromagnetic sensor in the tip controls temperature, therefore no adjustment is required. Rao says, "Metcal and OKi soldering systems feature SmartHeat technology, which, unlike conventional soldering irons, administers heat directly from the heater to the joint, ensuring total temperature control."

General selection criteria

Variable temperature and replaceable hardware are the two basic criterion for selecting soldering and desoldering stations. According to Ramavallabhan, the most important factor that buyers should consider is the cost of consumables of stations and availability of components like heaters, soldering tips and other accessories. He says, "These should be reasonably priced and easily available, otherwise the maintenance cost will be more than the cost of the actual unit."

He adds, "Non-availability of accessories when required could cost you customer's confidence and new opportunities."

Wattage of the station, precision in temperature control, display of the system and reliability in after-sales support are some important parameters to be considered, notes Jain.

Plethora of options

From Chinese-made to established brands, there are a variety of soldering and desoldering stations available in the market with a plethora of interesting features. Application, budget and possible future uses are three important factors to strongly consider before purchasing a station.

PCBs are increasingly becoming lead-free today. Major manufacturers are now making use of lead-free solder-to-solder components on boards. It could be beneficial in the long run to purchase a lead-free soldering station. Most stations designed for soldering leaded solders cannot be used for lead-free solders. Choose wisely. ●

electronica India 2015
inside tomorrow

www.electronica-india.com

productronica India 2015
innovation all along the line

www.productronica-india.com

September 9-11, 2015, Pragati Maidan, New Delhi, India

INDIA's # 1 TRADE FAIRS FOR ELECTRONICS INDUSTRY

SHOW HIGHLIGHTS

- **320+** Exhibitors
- **16000+** Visitors expected
- **Buyer-Seller** Forum
- **B2G Forum** Business to Government
- **Country Pavilions** from: China, Germany, Hong Kong, Singapore, Taiwan, UK

POWER PACKED CONFERENCES

DEFTRONICS™ 2015
Aerospace, Defense & Internal Security: Building Global Partnerships for "Make in India"
(September 9-10, 2015)
Organised by IESA

embed asia
International Conference on Embedded System in Automotive domain
(September 9, 2015)
Organised by CFEI

Conference on Internet of Things (IOT)
(September 10, 2015)
Organised by IET

IPC India Conference
IPC India Workshop
(September 10-11, 2015)
Organised by IPC INDIA

Conference on Smart Automation for SMEs
(September 10, 2015)
Knowledge Partner AIP

Pre-register online to visit & get a free Show Catalogue

http://goo.gl/H9jevP

Stay Connected with Mobile App

Available on the App Store

GET IT ON Google play

Exhibition Partners	Conference Partners	Supported by	Co-located	Organised by
Platinum Partner: NMTRONICS – Partners in Technology – SMT • SOLAR • SEMICONDUCTOR; iNEtest	Deftronics Conference; Badge & Lanyard Partner: XILINX; Associate Partner: ADVANTEST	Department of Electronics & Information Technology, Government of India; ELECTRONICS INDIA	IPC INDIA; LASER World of PHOTONICS INDIA	Messe München International
Associate Partner: ATOTECH; Badge by: Leaptech; Visitor Guide by: JUKI				

For more details contact: MMI India Pvt. Ltd. | Ms. Urmi Kothari | Mobile: 9833213370 | Email: urmi.kothari@mmi-india.in

Part 1 of 5

American Carrier Strike Groups: An Electronic Perspective

Fig. 1: A typical US Navy carrier strike group

B. Kamalanath is a technical writer. He is also a research scholar, pursuing Ph.D in military technology

An aircraft carrier is a moving airbase that can house approximately hundred combat aircraft. Being a ship, it can also sail to its war theatre quickly. By remaining in international waters, it can launch punitive airstrikes on enemy targets. A combat aircraft can drop two tons of bombs in one go. So, hypothetically, 100 aircraft from a carrier can drop 200 tons of bombs on the enemy's head, at a time.

A century ago, after the invention and eventual militarisation of the aircraft, somebody from the navy thought, "Why do we not operate aircraft from larger ships?" This idea led to the construction of a cantilever on a ship, from which the aircraft took off and landed on.

This resulted in the construction of dedicated aircraft-operating ships, which were called aircraft carriers or, simply, carriers. But these were not taken seriously, initially, and were used only as escorts or scouts to battleships, because during that era, combat aircraft itself was not considered an effective weapon altogether.

This perception changed during World War II as Luftwaffe (German Air Force) taught damaging lessons to allied nations about the combat prowess of aircraft.

From the other side of the globe, Japan delivered a devastating aerial strike at Pearl Harbour using their carrier based aircrafts. In one stroke, they almost entirely decimated the Pacific fleet of the US Navy (USN) but missed to destroy US navy's carriers.

USN, after losing powerful battleships, had to retort to aircraft carriers as primary fighting weapons. It urgently assembled various ships to form taskforces with carriers as centrepieces and other ships to protect the carriers. These taskforces proved their mettle in the subsequent Battle of Midway and numbed the supremacy of Imperial Japanese Navy (IJN) in the Pacific. From that instant, aircraft carriers took the driving seat in naval warfare.

Years after World War II, these taskforces morphed into formidable naval forces called carrier strike groups (CSGs). CSGs pack enormous strike power but, at the

Leader Of Vacuum Technology

lotvacuum
Leader Of Vacuum Technology
www.lotvacuum.com
global@lotvacuum.com
82-31-691-3652

Since establishment in 2002, LOT has been trying to be a leader in Vacuum industry worldwide developing new technologies and innovation.

BENEFITS

- Energy Efficency
  World Class Conservation of Resources
- Industry Leading MTBF
  Simplicity of design minimizes parts and wear
- Minimal Particle Deposition
  Short Gas Path enables quick exit of particles
- Minimal Process Deposition
  Unique Temperature Control enalbles heated of cooled loads.
- Extended Bearing Life
  Split Flow Design & Simply Supported Bearings Cancel loads.
- Extended Seal Life
  Non-contact Piston Ring Labyrinth superior to shaft lip seals.

GD SERIES

DD SERIES

HD SERIES

GHD SERIES

Fig. 2: E-2C Hawkeye, AEW aircraft (top); F-18 combat aircraft in a typical strike load out (centre to wingtip): external fuel tanks, bombs, anti-radiation missiles and short-range air-to-air missiles (bottom)

same time, come with a sky-high bill. For CSGs to survive and unleash their power, various electronic systems serve as the backbone. The electronic systems present in USN's CSGs and how these play crucial roles are the subject of foci in this mil-tech article.

Defensive combat operations

The purpose of a CSG is power projection; in simple words, launching combat aircrafts from the carrier stationed at deep seas and bombing the enemy. But the carrier being a highly-praised and priced target, objective of the enemy is to first destroy the carrier when the war begins. This could even turn the tide of the war.

Being a gigantic sitting duck on the sea, the enemy can easily find the carrier and attack either using aircraft, surface ships or submarines. So, in order to protect the carrier, a CSG typically comprises four to six destroyers (a kind of warship), two cruisers (a larger warship) and a nuclear attack submarine.

Destroyers are highly specialised in defending the carrier from threats posed by enemy surface ships and submarines. These also have respectable capability against aircrafts.

Cruisers, which are slightly larger than destroyers, are specialised in taking care of enemy air threats. Due to a larger size, these possess more weapon capability than destroyers. While destroyers operate at around 40km from the carrier to form a defensive perimeter against surface and sub-surface threats, cruisers operate in the vicinity of the carrier to provide air defence.

The two complement each other. Through a myriad of sensors, these can detect and neutralise the threats arising from all directions. Nuclear submarines sail well-ahead of the carriers looking for enemy submarines and operate loosely bound to the carrier. All these vessels try to form an impenetrable virtual bubble around the carrier.

A CSG wages offensive air strike battles (strike warfare) on the enemy and, at the same time, wages defensive battles against enemy aircrafts, enemy submarines and enemy surface vessels.

Air defence warfare

During World War II, in Battle of Midway, a group of aircrafts from the USN came directly above IJN carriers Soryu, Kaga and Akagi, and bombed these. This was the turning point of War at Pacific and even of World War II. Losing these carriers in just minutes proved too crippling for Japan, which ultimately put an end to Japanese Empire's naval supremacy in the Pacific in the days that followed. This ultimately led to the defeat of the Empire of Japan itself.

In hindsight, the radar's absence in Japanese carriers was the key. Ship-borne radars were yet to be introduced in these carriers. So, American aircrafts were able to bomb Japanese carriers undetected. But American carriers had been fitted with ship-borne radars, using which these could detect Japanese aircrafts beforehand and launch their aircrafts to defend in the nick of time.

Now, desperate Japan was looking to neutralise American carriers. To do so, some Japanese pilots rammed their aircrafts, fully-loaded with bombs and fuel, into American carriers, in what is called Kamikaze Attack. All these modes of attacks served as lessons for USN. When it started its ambitious carrier building and operating programme, air defence was given utmost priority.

Further to cement the importance of air defence, the USSR (of which the present Soviet Union was a part) entered into the picture as the newfound adversary of the USA to fight Cold War, a war fought without pulling a shot. The USSR sensed the challenging supremacy of the American carriers and fielded the deadly adversary of the carriers, the cruise missiles.

Having been developed inspired by Kamikaze aircrafts, cruise missiles offered a convenient means to attack a carrier. Earlier cruise missiles were just unmanned Kamikaze aircrafts.

From the cost perspective, a cruise missile costs a fraction of a carrier. But it is a very viable weapon, capable of being launched from bomber aircraft, warships and submarines. Incidentally, many of the early Soviet cruise missiles had nuclear warheads, sufficient enough to melt the entire steel present in the CSG.

The Soviet scheme was to simultaneously launch these missiles from submarines and bombers against the carrier from very long distances. Navigation computers of these missiles were programmed in such a way that all cruise missiles reached the carrier at the same time but from different directions. This was called the saturation cruise missile strike plan of the Soviet. Even if one cruise missile would hit the target, that would have been sufficient. This changed the situation in favour of the USSR.

Air defence warfare capabilities of the CSG have been on constant updates and upgrades all these years. Today, air defence systems of an American CSG can be termed as the most superior system in the world. Protecting the CSG from cruise missiles and cruise-missile-launching aircraft is called air defence warfare.

Air defence operations are carried out in four phases.

Phase I: Fighter aircraft and AEW aircraft combo

The first line of defence of the CSG is carrier-borne F-18 combat aircraft, which can operate far away from the carrier and shoot down enemy bombers before they launch cruise missiles. But these cannot find bombers quickly, because they do not know their exact location.

Onboard radars of F-18 aircraft can accurately scan specific sectors and specific altitudes but not all sectors and altitudes. To guide these towards incoming bombers, a dedicated airborne early warning (AEW) aircraft (also carrier-borne) is used.

These AEW aircraft, named E2, have huge radars. An inverted saucer-like structure on the top is the radome for the radar antenna. Radome is a structure made of radio-transparent material to protect the radar antenna from the environment. Inside this radome is the rotating antenna of the high-power UHF Doppler radar.

This radar can detect and track multiple threats on the sea and in the air. It can simultaneously and automatically detect and track 2000 targets, spread across the air and sea.

Fig. 3: AN/SPS-49 radar antenna

The aircraft keeps tab on an area of over twelve million cubic kilometres (three million cubic miles). Not only that, it can precisely track cruise missiles that fly low enough, as if skimming the water surface. Being a crucial component for the defence of the carrier, this radar is highly capable of resisting the jamming efforts of the enemy.

These aircraft maintain a surveillance patrol far away from the carrier and act as a command-and-control (C^2) station. These see what the radars of the CSG cannot see. If AEW aircraft detect any enemy bombers at a long range, these communicate the same to the carrier through a data link. Immediately, F-18 combat aircraft from the carrier are scrambled. These take off and race towards incoming enemy bombers to intercept and stop these from launching deadly cruise missiles. When F-18 aircraft reach their area of responsibility, AEW aircraft vector these towards the threat. F-18s intercept and shoot down bombers. There are four such AEW aircraft on a carrier.

Phase II: Air search radars and fighter aircraft combo

Air defence operations relying on this combination is a grave scenario. It occurs when the AEW aircraft itself has been shot down. This scenario is very much possible if the incoming enemy aircraft force is large. In this case, CSG radars are the only means to detect enemy air targets. For this, the carrier has two air surveillance radars: a 2D radar and a 3D radar.

2D air-search radar. A 2D radar gives the two dimensions of the target's position: range and bearing of the target. 2D radar AN/SPS-49 operates in L band (851MHz–942MHz) and can detect air targets at a range of 463km (250 nautical-miles).

It can scan up to an altitude of 46km. A two-cavity Klystron oscillator is behind its peak power of around 350kW. Due to the thinness of the beam produced, it becomes difficult for the enemy to jam it.

Its antenna rotates at 6rpm to detect flying objects at longer ranges. The flying object's position is updated every ten seconds. When that flying object approaches further, the antenna rotates at 12rpm. Now, the flying object's position gets updated every five seconds, which results in the target being tracked continuously.

This radar can simultaneously track 255 targets. Since it is sitting on the ship, it is subjected to the pitch and roll of the ship. To overcome this, the antenna is gyro-stabilised. And because of this, even if the ship rolls to the side or pitches up or down due to the waves, this antenna stays where it was before the roll or pitch.

Through identify friend or foe (IFF) components organic to the radar, the targets' friendliness is determined.

IFF shoots an ultra-short pulse-coded narrow beam of radar energy to the flying objects as a challenge. The friendly aircraft through an IFF receiver receives this and responds with a suitable reply. The radar receives this reply and classifies the flying objects as friendly aircraft. Now for the radar's IFF challenge, if there is no proper reply from an air-

craft, it is assumed to be a hostile aircraft, and its course is continuously tracked. All air-surveillance radars of the CSG have IFF.

3D air-surveillance radar. If a target of interest appears, 3D radar AN/SPS-48 takes over. A 3D radar provides the range and bearing like the 2D radar but also provides the height of the target, which is an extra dimension of the target's position.

Normally, to find the height of the target, a separate radar known as a height-finding radar (HFR) is used with the 2D radar. HFR's antenna always nods up and down to direct the beams to find the height of the target.

But 3D radar is a computer-controlled planar-array radar that varies its frequency instead of nodding the antenna up and down. By changing the frequency of the transmitted RF energy, this radar radiates a series of pencil beams. If the transmitted frequency is increased, the beam travels down the face of the antenna, and vice versa. The radar computer keeps track of the frequencies as these are transmitted and detects when the target reflects these. Further, it converts returned frequencies into meaningful altitude data. For finding the range and bearing, it simply rotates the antenna like a 2D radar.

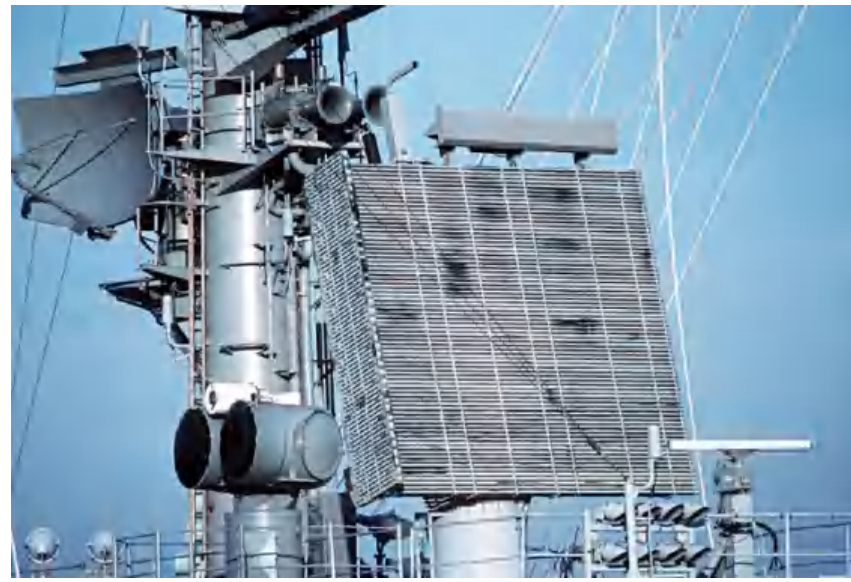


Fig. 4: AN/SPS-48 radar antenna

Operating in the range of 2900MHz to 3100.5MHz (S band), a 3D radar can detect targets up to a range of 407km (220 nautical-miles) and heights up to 30km. It emits radar energy with a peak power of 2.2MW and an average power of 35kW. It has automatic detection and tracking capabilities to simultaneously detect and track multiple air targets. It also has a moving target indicating (MTI) capability, which helps distinguish between moving targets from stationary targets. Hills or a landmass produce radar echoes, which is landmass clutter. In the radar-signal-processing circuitry, echoes from stationary features are attenuated. The resultant echo is of the moving targets.

Radar AN/SPS-48 is electronically-stabilised instead of gyro-stabilised. To compensate for the pitch and roll of the ship, the frequency emitted is changed to compensate it. This is similar to the height-finding technique.

Using this tracking data, fighter aircraft can be scrambled towards incoming threat to intercept it. The carrier constantly updates the aircraft with the target's location until interception, through datalinks.

However, if the enemy aircraft has launched its cruise missiles, the cruise missiles become the target. Engaging the cruise missile through the fighter aircraft becomes difficult. So, air defence warfare progresses to Phase III and is carried out through surface-to-air missiles (SAMs) of the CSG.

Phase III and phase IV of air defence operations will be covered in next part of this article.

To be continued next month

What is IFF and why is it necessary

During wartimes, under combat stress, identification of friends among enemies becomes difficult. A significant portion of fatalities occur due to mistakenly identifying a friendly unit as enemy. This is called friendly fire.

A notable incident occurred during the 1971 India-Pakistan war. After inflicting terrible damage to Karachi Harbour, Indian missile boats withdrew deep into Arabian Sea. Combat aircraft of Pakistan Air Force searching for these saw a warship and engaged it. But to the horror of both parties, that ship was a Pakistani warship searching for escaped Indian missile boats.

Identifying friends is important but, at the same time, enemies also have to be identified. During World War II, in Battle of Coral Sea, American combat aircraft intercepted some Japanese carrier based aircraft and shot down many of these. Remaining Japanese aircraft withdrew and headed for their carriers. These used radio direction finders (RDFs) to pin-point the location of their carriers.

In an RDF, there is a transmitter in the carrier continuously transmits a signal. The aircraft has a radio, which detects this signal and gives the exact direction of the transmitter.

Japanese aircraft were flying back in the evening towards their carriers. Unfortunately, unknown to them, Japanese transmitter's frequency was very close to that of the Americans. When the Japanese saw a carrier, they flew right beside it. The carrier flashed signal lights to the aircraft in an effort to confirm their identity. To the horror of the Japanese, it was an American carrier and not Japanese. The men in the carrier saw that those aircraft were not responding. This turned into a nightmare for the Americans as they realised that those were Japanese aircraft and not theirs.

Electronics Design Automation:

"The response is so fast it almost mirrors the real thing!"

How would you like to design a 1.5-million-transistor processor using just truth tables and K-maps? Electronic systems are so complex today that electronic design automation (EDA) tools are an absolute necessity. In this interview, we take a look at the advances worth noting in the world of EDA tools. Walden C. Rhines, chairman and CEO of Mentor Graphics, speaks with Dilin Anand from EFY

Q. What would you say are the three features that interest engineers the most, when it comes to emulators?

A. One is the move from traditional in-circuit emulation towards the capability for engineers to do a virtual stimulus. This means that engineers are now able to provide any sort of stimulus for the circuit through software.

The second is to be able to accelerate high-level test benches, whereas the third is for them to be able to do verification of large amounts of embedded software and even application software on the emulator itself.

Q. What is the most exciting recent development in the emulator space for the embedded software developer?

A. One of the things done in the last year has been to improve the performance of software debug from what was typically verifying at about 1MHz to now verifying at about 100MHz. For embedded software developers running something on an emulator means they really cannot tell the difference between whether they are running on an emulator or the real part or a field-programmable gate array board. This is because the response is so fast it almost mirrors the real thing!

Q. What is driving engineers to use EDA tools more often in the automotive sector?

A. In the coming year, the biggest growth will probably come in where embedded software, wiring and other automotive design products are coming into great demand as automotives are becoming more and more electronic. These (automotive companies) have the same design problems as any other company. It is too complex and has to be automated, and automation means EDA.

Q. How have PCB tools evolved over the years?

A. Today, a PCB is not what it used to be. This is because it is not really just limited to PCB but also encompasses system design now.

Q. Is there one significant change that you feel would affect almost every engineer using EDA tools?

A. One change that will affect everyone is the move from the current generation of design for test to the next generation called Cell-aware test. Traditional automatic test pattern generation (ATPG) assumes gate-level models and stuck-at, transition faults. Cell-aware tests for defects within the standard cell library.

Q. What is your take on EDA's perspective on the Internet of Things (IoT)?

A. The IoT has created a greater interest in multi-die packaging; in analogue and RF for relatively low-complexity designs. It has created interest in hybrid circuits that combine sensors, actuators, micro-electro-mechanical systems (MEMS) and other things with ASIC chips and then package these accordingly. It has affected Big Data processing chips, networking chips and data processing and has pushed the limits on the size of digital chips, so networking companies are making enormous chips to handle all information processing. These would get bigger as you get millions and millions of nodes feeding data and be able to computationally analyse it.

Q. How can engineers at cash-strapped start-ups get access to expensive tools?

A. Twenty years ago, start-ups would offer equity to EDA companies in return for their tools. They later realised that they are better off if they borrowed money and then paid for these tools. At the same time, these companies did not have the funds to equip themselves with the best tools. So we developed programmes where we offer a relatively complete set of design tools at a discounted price during the early years of a company. And as they become more successful, they pay standard prices.

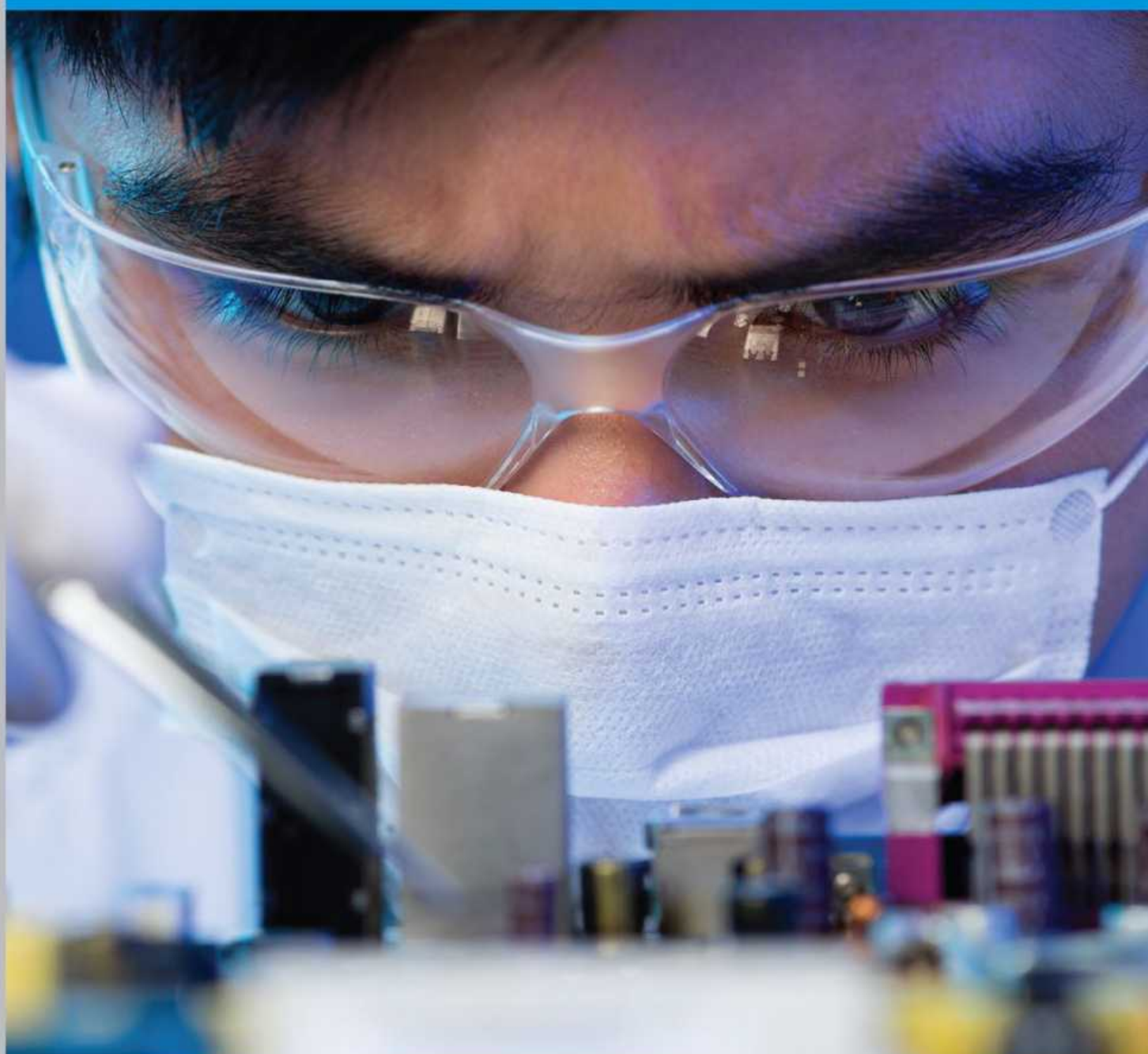
Q. What made you switch from TI to Mentor Graphics, a small company back then?

A. In 1993, I was running the semiconductor business at TI. I was 47 years old, and when I found out that I might have to wait at least 10 years before I could make CEO, I decided to move on. But, I had a non-compete agreement with TI.

When Mentor Graphics called me to tell me they were hunting for a new CEO, I decided to take them up on the offer as I always liked the design and creativity part of semiconductors. ●

CUBIX

Your Vision. Integrated.



“Our focus on excellence ensures your success.”

Electronics Manufacturing Services

PCB Assembly

Box Build Assembly

Wiring Harnesses

Design Services

Plastic Moulding

Consumer Electronics

Automobile

Telecom

Lighting

IT Peripheral

Home Appliances

Industrial

Defence

Cubix Control Systems Pvt. Ltd.

F-19, Sector-11, NOIDA-201301 Uttar Pradesh (U.P.), India

Ph: 91-120-4335714 • **Mob:** 09910385067 • **E-mail:** varun@cubixcontrolsystems.com

www.cubixcontrolsystems.com

Automotive Energy Storage:

"Ultracapacitors can augment battery performance"

A battery supplies energy to the car. But what about ultracapacitors? What can these do in terms of vehicle electrification and energy-efficiency? Abhishek Mutha of EFY got in touch with Jens Keiser, senior product marketing manager at Maxwell Technologies, to discuss ultracapacitors and their potential applications

JENS KEISER
SENIOR PRODUCT MARKETING MANAGER, MAXWELL TECHNOLOGIES

Q. Are ultracapacitors gaining traction among designers?

A. Automotive design engineers are expressing an increasing interest in leveraging ultracapacitors. Their ability to deliver power more quickly than batteries is making ultracapacitors excellent for high-power functions as well as freeing up batteries to serve functions that require long-term energy supply.

Ultracapacitors, in combination with batteries, present automakers the opportunity to build lighter, sleeker automotive architectures. Ultracapacitors have seen rapid success in start-stop systems and are making their way towards other technologies including electric turbochargers and active suspension.

Q. Why have these been successful in start-stop systems?

A. An ultracapacitor enables micro-hybrid start-stop systems to reduce fuel consumption and emissions by shutting off the car's internal combustion engine as the vehicle slows down. It then seamlessly restarts the engine when the driver engages the clutch or touches the accelerator. Because the ultracapacitor provides burst power to restart the engine, it takes tremendous burden off the battery, thereby relieving the battery of high current and repetitive cycling that often shortens battery life.

Lamborghini has also designed ultracapacitors for start-stop systems, and according to a report by Sweden's Auto Motor and Sport, Lamborghini start-stop systems can restart the engine in just 180 milliseconds.

Q. Any other designs where ultracapacitors are used?

A. Other than start-stop, ultracapacitors currently provide cranking power for heavy diesel trucks transporting goods across the USA.

Our engine-start module replaces one lead-acid battery, providing cranking power for Class 7-8 and Class 3-6 diesel trucks for temperatures as low as -40°C to as high as 65°C.

Q. How integrating ultracapacitors in turbocharged engines could benefit original equipment manufacturers?

A. Newer, stricter emissions and mileage mandates are pressuring auto manufacturers to discover ways to increase fuel economy without sacrificing performance and quality of the driving experience. One of the most promising approaches is to integrate downsized turbocharged engines as a method for increasing fuel efficiency without compromising power output.

According to Navigant, 75 per cent of Ford gas and diesel engines and 85 per cent of Volkswagen engines were turbocharged as of 2014 model. Similar installations are underway at Audi, Volvo and others. In the next generation of vehicles made in the USA and abroad, testing ultracapacitors for this application will likely show that these are able to handle additional current and cycle loads of an electric turbocharger.

Q. Any other areas where this is likely to be adopted?

A. Active suspension is another area that will most likely adopt ultracapacitor technology due to the system's requirement for high power but low energy demand. Active suspension improves fuel economy, makes energy regeneration possible and provides faster response time.

Ultracapacitors offer several benefits in active suspension, including outstanding power density and adequate energy density, a wide operating temperature range, long cycle life and calendar life. The low internal resistance of ultracapacitors ensures high efficiency that results in low power losses and low safety requirements.

Q. Can ultracapacitors replace batteries in automobiles?

A. Ultracapacitors work collaboratively with batteries and together the devices can make a winning solution. The ultracapacitor can augment battery performance, taking on high-power functions so that the battery can do what it does best—supply energy to the functions that need it over longer periods of time.

In the case of Peugeot Citroën, ultracapacitors provide cranking power and voltage stabilisation. Currently, there are over one million Peugeot Citroën cars on the road using Continental system based on ultracapacitors.

Q. What is the future for ultracapacitors?

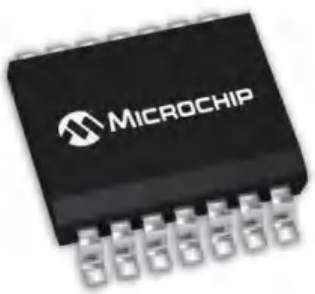
A. Ultracapacitors are building a proven track record in start-stop and engine cranking, and these have tremendous opportunity to improve upon technologies such as e-turbo and active suspension. ●

Smart Lights Are Better Lights

Modern LED lighting applications require more than just the capability to be turned on and off. Designers need a solution that offers digital control to smooth dimming, as well as color temperature tuning, usage-based lifetime prediction and networked communication for monitoring and control. Also don't forget the challenge of complying with changing efficiency standards.

Microchip's PIC® microcontrollers with intelligent analog integration make it possible to get advanced features like these from the same chip that controls the power conversion.

Make your next LED driver design better. Make it smart.



India Sales Offices:
Bangalore (080) 3090-4444 • **New Delhi** (011) 4160-8631 • **Pune** (020) 3019-1500
Email: asia.inquiry@microchip.com

MICROCHIP

www.microchip.com/lighting

Chipset Integration:

"Engineers today are looking for MCU-integrated modules"

Technologies such as the Internet of Things (IoT) are providing unparalleled opportunities for businesses. New modules with rising levels of integration are easily available and cost-effective. So, how does one decide between a module and a chipset for an application? Let us find out as Abhishek Mutha of EFY speaks with Dhiraj Sogani, GM and senior VP, Systems Business Unit at Redpine Signals Inc.

DHIRAJ SOGANI
GM AND SENIOR VP,
SYSTEMS BUSINESS UNIT,
REDPINE SIGNALS INC.

Q. Most IoT devices are designed to be small in size. What are engineers looking at while selecting a wireless module?

A. If everything is integrated together in a module, the overall size and cost of the IoT solution will also be extremely less, making products competitive. Engineers today are looking for microcontroller (MCU) integrated modules where they can write their own applications.

Integration of software is another factor looked at. Traditionally, an MCU was being used to run all software, but today engineers want a major chunk of software to run on the module itself. Modules not only run software of wireless protocols but also networking software like Transmission Control Protocol/Internet Protocol (TCP/IP) stack, Secure Sockets Layer (SSL)/Transport Layer Security (TLS) or Hypertext Transfer Protocol Secure (HTTPS).

Q. Majority of IoT devices are battery-operated. How can low power consumption be achieved?

A. Peak current consumption and overall average current of a module must be low. Modules have multiple sleep modes available, making it possible to turn protocols and devices on and off as desired, thereby helping in reducing power consumption.

In addition to keeping power consumption low, regulatory certifications [such as Federal Communications Commission (FCC) and Industry Canada certification (IC)] and protocol compliances [such as Wi-Fi Alliance and Bluetooth Special Interest Group (SIG)] are also critical in selecting the right solution as the timeline, cost and risk associated with these is quite significant.

Q. How important is it for a module to provide dual-band support for Wi-Fi technology?

A. Wi-Fi operates in two spectra, namely, 2.4GHz and 5GHz. 2.4GHz band is very crowded today because several other technologies such as Bluetooth are operating in this spectrum. The number of devices operating in this band is increasing significantly and the number of available channels is very less. For quality and reliability of connection, customers have started moving to 5GHz band.

Q. What kind of integration would you recommend for IoT products if cost was the only key factor?

A. Designers are moving towards highly-integrated wireless modules, and chipset level integration is going down.

The capital and expertise needed for wireless chipset integration is enormous. You need to have radio frequency expertise, necessary test tools in place and you need to go through reliability testing, performance testing, regulatory certifications and protocol compliance to ensure that you are meeting all the requirements. This increases the chipset integration cost, driving customers to an integrated module, where all these issues are taken care of.

Q. What do you think are the parameters design engineers should consider before buying modules?

A. The first thing that an engineer needs to look at is data throughput requirements of the application. A set-top box or a wireless display will have completely different requirements as compared to a machine-control application.

Second factor is power consumption. The designer should decide if the device is going to be wall-powered or battery-operated. It is also important to ascertain the maximum peak power consumption that the device can sustain.

If using a Linux operating system (OS), most of the software can be run on the MCU without any problem. But if a small real-time operating system or no OS is used, you will need a module that literally runs everything.

Q. You recently announced a module for vehicle-to-vehicle communication. How is your solution unique?

A. This module uses 802.11p and we are incorporating standard Wi-Fi, Bluetooth and ZigBee into this module to make it a complete vehicular communication solution. It would help in creating onboard units that go inside the car or road-side units that are mounted for collision avoidance, traffic scenario communication between different vehicles, toll collection and several other applications.

Several automobile companies are looking into such solutions. We expect them to go into mass adoption in 2016. We also have solutions coming up where an MCU will be integrated inside the modules.

life.augmented

STM32 L4

STM32L4 MCU

Excellence in ultra-low-power with performance

- 100 DMIPS based on its ARM Cortex-M4 core with FPU and ST ART Accelerator™ at 80 MHz
- Dynamic run mode down to 100 µA/MHz and 30 nA with backup registers without real-time clock
- Smart Peripherals: 3 x 12/16-bit ADCs (up to 5 Msps) Down to 20 µA (10 Ksps) and 2 x 12-bit DACs (1 Msps)
- 4 nA VBAT mode with charging capability

ULTRA-LOW-POWER EXCELLENCE

The STM32L4 microcontroller is based on a new ultra-low-power platform featuring FlexPowerControl which extends flexibility to reach optimized power consumptions. With an EEMBC ULPBench score of 123 ULPBench™-CP, the STM32L4 outperforms the market in the ultra-low-power domain

HARDWARE TOOLS

A full set of evaluation boards enables flexible prototyping as well as full STM32L4 evaluation

SOFTWARE TOOLS

STM32CubeMX enables fast development thanks to its MCU clock configurator, power consumption calculator and code generation tools

STMicroelectronics Pvt Ltd
Plot No 1, Knowledge Park III,
Greater Noida 201308, Uttar Pradesh, India

Authorized distributors

• **Arrow: Murali:** +91-96866 79492 • **Asia Lucky: Rekha:** +91-98999 75331 • **Avnet: Sravanthi:** +91-99805 67572
• **EDOM: Raghunatha. G:** +91-81304 26926 • **Future: Pawan:** +91-98452 22703 • **Teck: Sumit:** +91-98997 35127
• **Tomen: Priti:** +91-98197 94974 • **WT: Ramkumar. N:** +91-90080 88998 • **Yosun:** Anurag: +91-99106 45646

Send Enquiry to: mcu-enquiry@st.com **For more information, visit www.st.com/stm32l4**

This Month's DVD Contents

This month's DVD contains some interesting electronics design automation (EDA) tools for design and simulation, programming tools and informative videos complemented with some useful resources and fun applications

ABHISHEK A. MUTHA

CadSoft EAGLE (version 7.3.0)

EAGLE PCB design software is a popular tool of choice for many design engineers and academia across the world. It comprises features like a schematic capture editor, PCB layout editor and an auto router, to name a few. Make sure you select *Run as Freeware* option to access EAGLE Light Edition for free and non-commercial or evaluation usage.

KEMET SPICE (version 4.0.3)

This software is aimed at supporting design engineers in analysing the performance of capacitors over direct current (DC) bias conditions, ripple, temperature and frequency. The different kinds of capacitors include polymer, aluminium polymer ceramic (MLCC) and tantalum. Although it is a stand-alone Windows based program, it is able to create files that can be imported into some of the commercial versions of SPICE.

Fritzing (version 0.9.2b)

In the spirit of processing and Arduino, Fritzing is an open source software tool that makes electronics accessible as a creative material for anyone. It allows you to document and share your prototypes with others, impart electronics lessons in a classroom and layout as well as manufacture professional PCBs. This version brings you many latest new popular parts such as Raspberry Pi 2, RaspIO Duino, STM32 Nucleo and many more.

Rapid SCADA (version 4.4)

Rapid SCADA is a free, open source and full-featured supervisory control and data acquisition (SCADA) software. Using Rapid SCADA you can create automated systems such as industrial automation systems, home automation systems, energy accounting systems and any other systems that contain controllers, sensors and relays. The latest version contains all primary Rapid SCADA applications, a set of basic drivers and the configuration database with ready examples.

Qucs (version 0.0.18)

Quite Universal Circuit Simulator (Qucs) is an integrated circuit simulator, which allows you to set up a circuit with a graphical user interface (GUI) and simulate the large-signal, small-signal and noise behaviour of the circuit. Post simulation, you can view the results on a presentation page or window. The GUI is based on Qt by Digia. The software aims to support all kinds of circuit simulation types such as S-parameter, noise analysis, alternating current (AC), harmonic balance analysis and DC, to name a few.

IT++ (version 4.3.1)

IT++ is a C++ library of mathematical, signal processing and communication classes and functions. Its main use is in simulation of communication systems and for performing research in the area of communications. In order to use all functionality provided by IT++ library, it is recommended that you have some external libraries compiled and installed on your computer. This is why we have also provided the basic set of those external libraries, namely, BLAS, LAPACK and FFTW (version 3.3.4) with IT++.

Programming Without Coding Technology (version 1.9)

Rather than creating your application in a few steps, Programming Without Coding Technology (PWCT) is a general-purpose visual programming tool designed for novice and expert programmers. While a novice can use it to learn programming concepts such as data structure, control structure or programming paradigm, an expert can use it to develop large and/or complex software. With support for languages like Harbour, Supernova, C, Python and C#.NET, you can see/edit the generated source code. ●

The author is a senior technical correspondent at EFY

Now, run all software on EFY+ DVD irrespective of OS requirements

With Oracle VirtualBox 5.0 bundled with this month's DVD, you can now run any software tool and legacy applications in a virtual environment. VirtualBox runs on Windows, Linux, Macintosh and Solaris hosts, and supports a large number of guest operating systems including, but not limited to, Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7 and Windows 8), DOS/Windows 3.x, Linux (2.4, 2.6 and 3.x), Solaris and OpenSolaris, OS/2 and OpenBSD.

Some popular resources

- ClamWin (version 0.98.7)
- Expert PDF Reader
- VirtualBox (version 5.0)
- WinDirStat (version 1.1.2)
- Wireshark (version 1.12.6)

Other tools

- Tiny Multi Bootloader+ (v0.10.0). Serial bootloader for Microchip, Atmel, NXP, TI, 8051 microcontrollers (MCUs)
- Magic VLSI layout tool (version 8.0.207), SVEditor (beta version), OpenCV (version 3.0), Universal JTAG library, server and tools (UrJTAG version 0.10) and PPMScope (MCU based PC oscilloscope)

Create Superlative Images with OpenCV

PRIYA RAVINDRAN

Open computing language, or OpenCV, as the name suggests, is an open source software that aims at computing efficiency and bettering real-time computer vision. An image processing software, OpenCV, helps us achieve whatever we want to do with images, right from understanding these to completely ripping these apart.

What can you do with OpenCV

Images can be of two kinds, namely, hand drawn or captured. In both cases, when we are dealing with images, there are two things we might want to do: understand the images completely and make these visually appealing.

OpenCV lets you do both, by providing a variety of functions and features, which, when used correctly, give the desired result. With more than 2500 optimised library algorithms and new algorithms that can be written easily, it lets you work with images in an easy and comfortable manner.

Masking. A mask is a spatial filter. When we need to hide a certain region of an image, we can use a corresponding mask. It is like using a black-and-white filter on the image, wherein the black region blocks out the image, while the white region acts as a transparent sheet. An example can be seen in Fig 1.

Contrast and brightness. To enchance the image's appeal, we can play around with brightness and contrast features. Changing the contrast changes the difference between the selected region and its background, while brightness changes the appearance. We use the two to please our visual perception.

Smoothing, blurring, blending and sharpening. The anti-aliasing approach that finds usage right from image to audio processing is similar to smoothing and blurring the image.

Smoothing and blurring help us nullify the difference between jagged edges and the rest of the image. These aid in generating background effects, shadows and even achieve region highlighting.

Blending involves mixing two layers by placing one on top of the other. Depending on the opacity of the two layers, the resulting effect can be hiding the bottom layer or dissolving the two or a transparent top layer. The reverse process; if we want to recover fine details of an image that is blur or low on resolution, we can sharpen the image.

Add noise. OpenCV lets us add a realistic angle to the image by corrupting it. This is like simulating the setup, taking into account noise from the detector, salt-and-pepper noise or data-transmission noise and also image-dependent noise.

Boost, identify and recognise. We can follow eye movements in a video by tracking or measuring the point of gaze or the motion of the eye relative to the head. Removing red eyes in an image taken using flash is also a simple task. Boosting image classification by categorising images that can be used as a base in future. We can recognise scenery, as the tool compares the new image with previously-recorded ones.

The same goes with identifying or tagging people. Tracking objects and detecting motion in videos also take place using the same process.

OpenCV in real life

- Stitching street-view images together
- Detecting intrusions in surveillance videos in Israel
- Monitoring mine equipment in China
- Helping robots navigate and pick up objects at Willow Garage
- Detecting swimming-pool drowning accidents in Europe
- Running interactive art in Spain and New York
- Checking runways for debris in Turkey
- Inspecting labels on products in factories around the world
- Rapid face detection in Japan
- 2D and 3D feature toolkits egomotion estimation
- Human-computer interaction and mobile robotics
- Stereopsis stereo vision (depth perception from two cameras)

Fig. 1: Hiding an image behind a mask (Image courtesy: docs.coronalabs.com)

Software overview

Language	:	C++ (also supports C)
Interfaces	:	Python, Java and MATLAB/OCTAVE
Wrappers	:	C#, Perl, Ch and Ruby
Operating system	:	Desktop - Windows, Linux, OS X, FreeBSD, NetBSD and OpenBSD Mobile - Android, iOS, Maemo and BlackBerry 10
Release sources	:	SourceForge, GitHub
Built using	:	C Make
Licence	:	3-clause Berkeley Software Distribution (BSD) licence
Website	:	*opencv.org*
Corporate users	:	Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda and Toyota, and start-ups such as Applied Minds, VideoSurf and Zeitera

Fig. 2: Creating sketch effect by detecting edges (Image courtesy: www.bogotobogo.com)

A blog created exclusively for tutorials for OpenC: *opencv-srf.blogspot.in*

Segmentation, edge detection and morphology. With this tool, the image under processing can be partitioned into multiple segments by using the thresholding approach. Also, points, lines and edges in an image can be easily detected by simply applying different order derivatives to the image. Fig. 2 shows what an edge-detected image looks like.

Morphological operations process the image based on shapes or templates called structuring elements, and we can apply image pyramids to either upsize or downsize the image.

Histogram. Analyse your image by obtaining the image histogram and studying the intensity distribution. The tool scans the entire image, tabulates different intensities and increases the corresponding intensity count as it scans the image, simultaneously. Fig. 3 shows a sample histogram.

We can use this information, which is generally seen as a graph, to fix threshold limits and decide the pixel adjustments to be made to the image. The histogram can also be equalised to improve image contrast.

Transformations. Convert the image from the existing spatial domain to corresponding frequency domain by applying Fourier transform. To find imperfect instances of objects, like circles and other classes of shapes in your image, apply Hough transform. The image can also be remapped by moving existing pixels to a new image.

The complex math and a little beyond. Statistical evaluation using expectation-maximisation algorithm, k-nearest neighbour algorithm, random forest and support vector machine is made easy by simply coding it into the tool and then applying the same on the image.

Decision tree learning can be used to predict an image's target value by mapping observations. Multi-dimensional scaling, naive bayers classifiers and gradient boosting help you work with the images better. Image analysis can even be extended to the level of neural networks, converting neuron connections to numeric weights that can be worked with.

If you want to make your own videos with existing images, you can interact with and manipulate the real world around using augmented-reality feature.

The added modules. We can create three dimensinal (3D) reality from two dimensional (2D) images using Calib3d. Point detectors, descriptors and matching framework options can be found in Feature2d. Algorithms to perform motion extraction, feature tracking and foreground extractions on the video stream are provided in the video module.

Graphical processing. An exclusive graphical processing unit (GPU) module helps squeeze out every little computation power from the system by using the power of the video card to run OpenCV algorithms. Based on compute unified device architecture (CUDA), the module provides GPU acceleration and helps developers run more accurate and sophisticated OpenCV algorithms in real-time on higher-resolution images, while consuming less power.

Added support to OpenCL in the library enables the codes to take advantage of the heterogeneous hardware, in particular utilise the potential of discrete and integrated GPUs.

Graphical user interface (GUI). The built-in GUI allows easy access to the functionalities of OpenCV. We can add track bars to applications and also read videos or create new ones. There are also methods to perform similarity measurements to check if two videos or images are copies of each other.

Pointers from the latest release

OpenCV 3.0 gold release, as it is popularly called, has a transparent application program interface, which is a GPU-acceleration layer using OpenCL, introduced with support from AMD and Intel. With access to a sub-set of Intel's integrated performance primitives, improved Python and Java bindings, new MATLAB bindings and accelerated functions using NEON intrinsics, it promises to be the most functional and fastest OpenCV ever.

Projects from Google Summer of Code programme have been integrated into this release. Biologically-inspired vision module, DAISY features, LATCH descriptor, improved BRIEF and image registration module are contributions from communities.

Further, features like text detection, line descriptors, general use optimisation (hill climbing and linear programming), computational photography algorithms (HDR, inpainting, edge-aware filters and superpixels), tracking and optical flow algorithms, 2D shape-matching module and 3D surface-matching module, RGB-D module and visualisation tool-kit based 3D visualisation module have been introduced.

Installation and setup

The installation process of OpenCV involves installing libraries and packages for different platforms. Although it seems complicated, tutorials on the website guide you with step-by-step details of doing the same. The library can be downloaded from an already existing setup or one can even create his or her own library from scratch.

The latest version OpenCV 3.0 can be downloaded from SourceForge, for various platforms, as follows:

Windows self-extracting archive: *sourceforge.net/projects/opencvlibrary/files/opencv-win/3.0.0*

iOS framework: *sourceforge.net/projects/opencvlibrary/files/opencv-ios/3.0.0*

The source code for all platforms can be downloaded from GitHub: *github.com/Itseez/opencv/archive/3.0.0.zip*

Various books have been authored exclusively on OpenCV. Getting a hand on one might prove to be just what we need to work our way through this software. There are books like *OpenCV for Secret Agents, Computer Vision with OpenCV* and *Learning OPenCV*, to name a few. Books even come in platform-specific versions. One can take a look at the books on *opencv.org/books.html*

What the users have to say

OpenCV seems to be top-notch when one takes into account first-hand experience. Starting from installation to running the tool, the process turns out to be smooth. Easy-to-read documentation, a powerful and well-designed library and great algorithms appeal to the user.

What works in OpenCV's favour is the user-friendly software and multiple features, along with regular updates. Good quality, being stable in terms of functionality and fast working pace make people adapt to it easily.

GPU module is a value addition. Some go on to say that, with just a little improvement on the GUI front and specific documentation sections, the tool could even become the future of image processing. No wonder then that OpenCv has a rating of 4.8 on 5 from SourceForge.

The website provides documentation and tutorials for every possible operation that can be performed within OpenCV. An answers page allows you to post questions or replies to others' questions. Even after repeated attempts, if bugs are not solved, you can report these or request new features to be added, on the website. You can find OpenCV projects at *code.opencv.org/projects/opencv*

If you want to try out other tools, you could go for VLFeat, WEKA or ToolIP.

Try OpenCV to play with your images and make these fit for your application. All you need to do is install the setup from our DVD. Make sure you choose the right version for your platform. Open into the OpenCV experience! ●

Priya Ravindran is a technical journalist at EFY

More about OpenCV

Image to matrix. All images, be it from a camera or scan or even magnetic resonance imagery, are converted to a matrix containing intensity values of pixels, with the help of Mat. OpenCV processes and manipulates the information to perform necessary tasks.

Storing an image. Images can be stored in colour formats as required by the user. The user decides the colour space and data type to be used, for example, grey-scale or red-blue-green (RBG) formats.

The different methods of scanning images, decided by the style of coding are:

1. Efficient way using classic C style
2. Iteration method that considers images as sections and reads these by approximating each section
3. On-the-fly method used when one wants to specify the row and column number of the item that is to be accessed
4. Core function method that creates look-up tables (LUTs) that can be referenced in the code. Data from LUTs is automatically taken into consideration when called upon, and it either replaces or aids calculation of the particulars of the image being processed.

This is what the makers conclude, "If possible, use the already-made functions of OpenCV. The fastest method turns out to be LUT function. However, if you need to write a simple image scan, use pointer method. Iterator is a safer bet, however, it is quite slower. Using on-the-fly reference access method for full image scan is the most costly in debug mode. In the release mode it may beat the iterator approach, but it surely sacrifices the safety trait of iterators for this."

Fig. 3: Analysing a photo using a histogram (Image courtesy: picshype.com)

Make Your PCB Design Ideas Fly High With EAGLE

PRIYA RAVINDRAN

You set out to design your own printed circuit board (PCB) but are confused about which tool to use. How do you come to a decision? What are the factors you need to consider? In this article, we introduce you to EAGLE and tell you what you need to know to work with this tool.

EAGLE, a prototype of CadSoft Computers, is an easily applicable graphical layout editor. It is a flexible, expandable and scriptable electronic design automation application with three modules, namely, schematic editor, layout editor and library editor, with identical user interfaces (UIs).

Designing your circuit has been made easy by access to design components in Farnell database, from within EAGLE environment via DesignLink, from within EAGLE environment, owing to the acquisition of CadSoft by Premier Farnell in 2009. Thus, you have everything you might need, in one place.

A new angle in simulation

EAGLE supports the newly-developed interface of PCB-Sim that lets you do the following:

1. Perform signal integrity analysis to ensure proper signal flow, even before proceeding to the layout stage

2. Calculate transmission line properties using the line calculator

3. Read S-parameter based data and convert to time-domain, with automatic correction of inaccuracies in the input data

4. Work between EAGLE based and SPICE based models with the addition of an integrated SPICE simulation engine. Also, see the circuit's functioning as waveforms

5. Easily import input-output buffer information specification models that describe the behaviour of an integrated circuit, thanks to SPICE engine

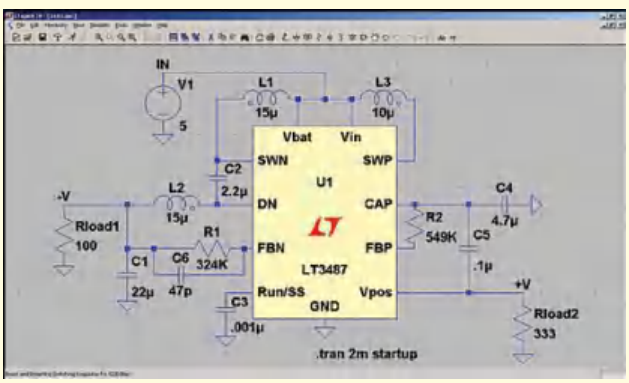


Fig. 1: Simulating with SPICE
(Image courtesy: chrisgammell.com/best-free-spice-program)

Route your design as EAGLE flies

Autorouting is fully integrated into the basic program. You can choose between manual or automatic routing option, and switch between the two easily. If you choose to go with the manual routing method, simply follow the follow-me-router tool that guides you at every stage. The smallest routing grid is 0.02nm in size. You can place components as you please, within the layout structure and use up to 16 signal layers. If you

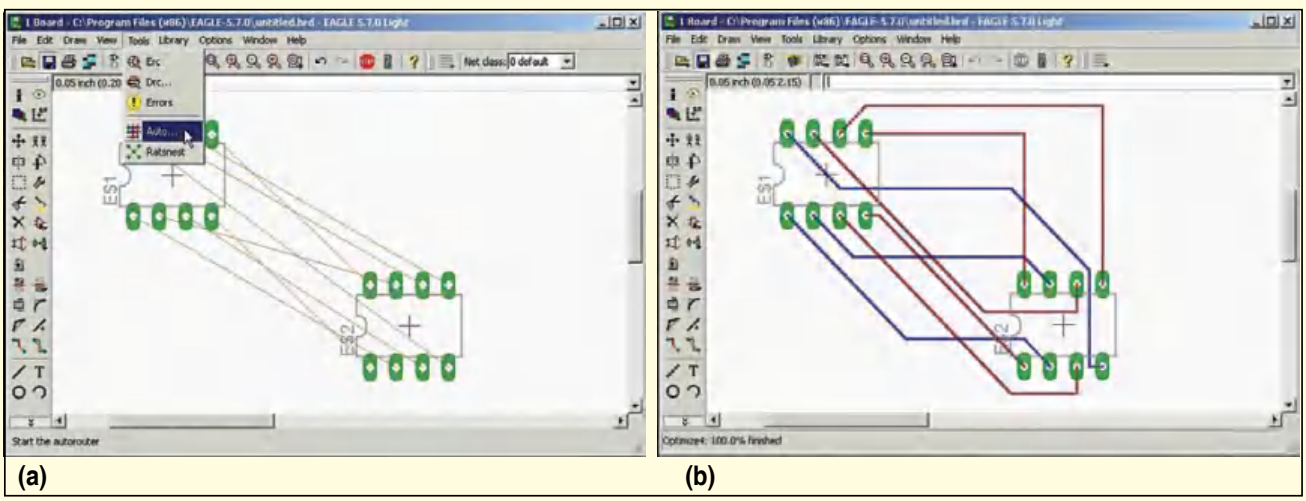


Fig. 2: Make your design route by itself: (a) before autorouting, and (b) after autorouting (Image courtesy: www.youtube.com)

spot an error after you finish your design, there is no need to panic. You can rework your design as many times as you want, with Ripup&Retry algorithm.

You are done with circuit construction but your design is so huge that you have multiple ways of routing the signals. Which path do you choose? How do you decide which is better? Version 7 of the tool comes to the rescue with multi-thread routing. With this, you can run multiple configurations simultaneously and choose the outcome that best accommodates your design. You can also choose to go with TopRouter option that results in boards with significantly lesser points of transition and effectively reduces cost and effort.

It has never been easier to print a PCB

Print your PCB without any hassle with the integrated PCBQuote within EAGLE. You can choose from options like quick-turn PCB prototypes, full-specification prototypes, low-cost production and custom PCB quotes, thanks to a tie-up with PCB manufacturers.

The software is compatible with Windows, Linux and Mac systems and is easy to use. SparkFun, the popular do-it-yourself site, works with EAGLE files. Adafruit, Arduino and Dangerous Prototypes also put EAGLE to good use.

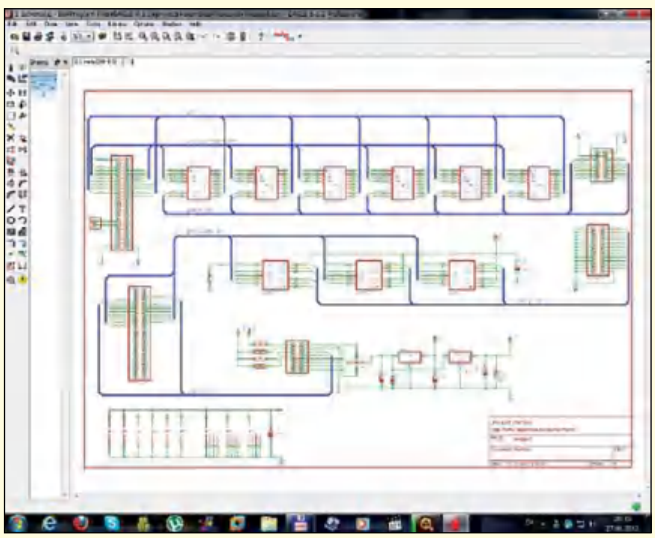


Fig. 3: A scheme of the schematic
(Image courtesy: thegioitinhoc.vn/do-hoa)

Eager to get on it but wondering where to start

Design the schematic. First, create a new project for your design. Make sure you include all required libraries, and whatever you create next, under this folder.

Next, open one of the 999 sheets provided and make your circuit. Add the parts; you can either drag-and-drop these or simply copy from another circuit, connect these together and use the automatically-generated supplies to power your circuit. You can even define your own net classes.

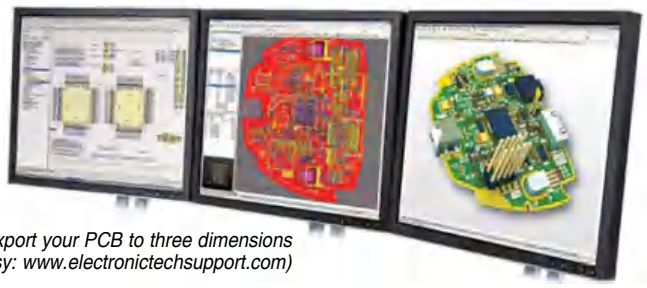
Once the circuit is done, run an electrical rule check to check for design errors and schematic-layout compatibility issues.

To make your work easy, you can also use pre-written programs, the user language programs (ULPs). You just need to add the ULP to your code and run it, of course, with the modifications you need. You can find ULPs at *www.cadsoftusa.com/downloads/ulps*

Create the layout. The layout is a 4m × 4m structure offering full support to surface-mount devices and you work with it using the layout editor. You can play around with your circuit to make it look exactly the way you want. Lock in place the components in your schematic, rotate these at arbitrary angles and add text to name components and orient these as you wish.

The new and exciting

- View and work with library components much easily with an enhanced library editor
- Access components better with a revamped control panel
- Improve performance and simplify installation with the 64-bit version
- Get a clear 3D picture of your design and make 3D PCBs with the extended intermediate data format option
- Sub-divide your design and reuse it with the hierarchical design feature that was introduced in version 7.2
- Enjoy the visual experience with a modernised graphical UI



Export your PCB to three dimensions
(Image courtesy: www.electronictechsupport.com)

Awards and accoloades

EAGLE has been placed first in the category Development Software of the annual readers' awards by German magazine *Elektronik*, consecutively, in 2014 and 2015.

Elektronik has awarded CadSoft's EAGLE software Engineering Software Product of the Year nine times (in the years 2000, 2003, 2004, 2006, 2009, 2010, 2012, 2013 and 2014). The award is decided by votes from the design engineering readership of the German based magazine.

Tracks are flexible and the layout also supports differential pair routing. As you route your circuit, signal lines are dynamically quantified. Run a design rule check, and check if your design is correct. Generate data in whatever format or package variant you require by defining the programming language.

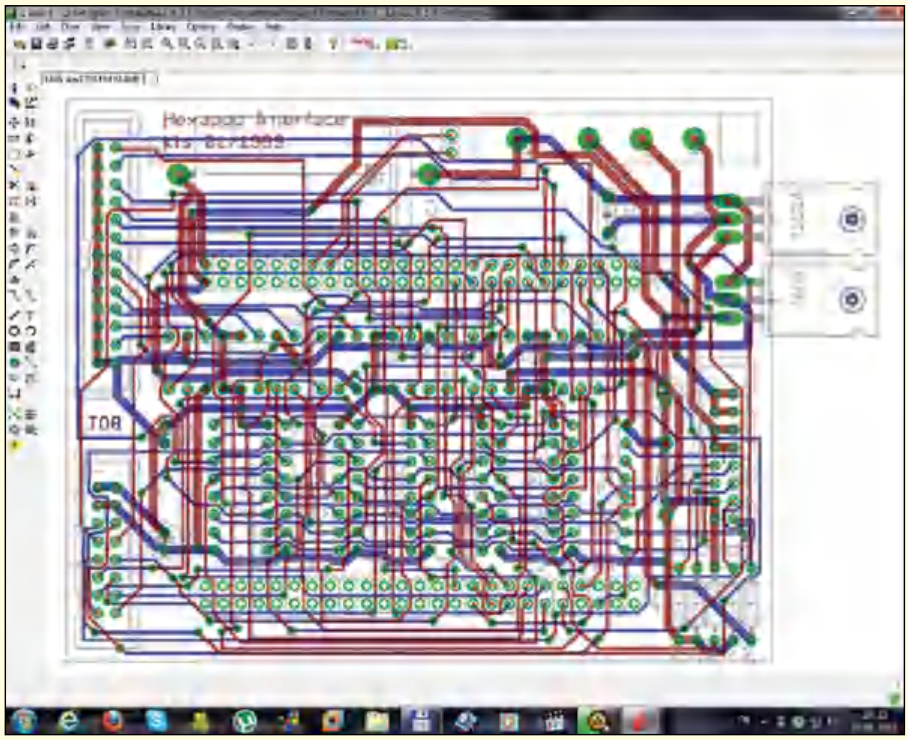


Fig. 4: Be your layout's architect (Image courtesy: thegioitinhoc.vn/do-hoa)

Offering the support you might need

Registered EAGLE customers are always free to write to the technical team at their respective locations, the email ids of which can be found on their website. A frequently asked questions (FAQ) page (*www.cadsoftusa.com/training-service/faq*) and a forum (*www.cadsoftusa.com/community*) aids in solving user queries. A download area (*www.cadsoftusa.com/downloads/libraries*) provides links to all their latest releases.

CadSoft also provides online trainings, webinars, videos and tutorials to help you work with the software, the details of which can also be found on their website.

You can purchase the software online by logging into CadSoft website (*www.cadsoftusa.com*). Once bought, upgrades, licence renewal, additions like the library, projects and so on require minimal effort. Decide if this is the right tool for you by becoming familiar with the limited version. All you need to do is install the setup from the DVD and explore. The same is also available on the official website as EAGLE Light Edition.

Users and their views

EAGLE seems to be getting mixed reviews. While it has its own set of loyal customers who have been using it for years, some users seem to prefer other software like KiCad, Circuit Wizard and Design Spark.

What makes EAGLE kick for the loyalists is the free version (limited only by the size of the board), support and response from CadSoft to their queries, the fact that there is information aplenty available about EAGLE and strong support from PCB manufacturers.

The problem areas have been the language in the UI; terms used seem to convey meanings other than intended, like usage of 'drop' for 'hide' and such. There are also some complaints about the software being a little tedious to learn initially, but once you spend that initial time, you seem to have learnt the trick.

Well, a software application that is a winner of awards and one that has so many regular users, including commercial PCB designers and professionals, must have something right in it. With the tool being upgraded with every new release, it is left to you to try this for yourself and arrive at a verdict. Write to us about your take on EAGLE, after using it. ●

Quotes courtesy: *www.newark.com/cadsoft*

"Each module you can imagine, starting with a simple power adaptor via the motor-control module, up to the battery management system developed in-house, is developed by using EAGLE. In this case, EAGLE is a one-stop solution. First, it can be used to create circuit plans and layouts, ranging from simple to complex. EAGLE makes it child's play to optimise the size of the board or the general arrangement of components. Since elements such as the required training period and efficiency (one program for all) are our top priority and the setup has allowed all students, even those without any previous knowledge, to get to grips with the operation in just a few hours, EAGLE software package from CadSoft has become a standard tool, which we cannot do without."

—Sarah Schwöbel, municHMotorsport

"What I like most about EAGLE is the flexibility it offers. With EAGLE ULPs, there is no limit to what I can create [in terms of] designing PCB boards!"

—Thomas Benoit, SERELEC

"I design my boards using EAGLE, buy components via the integrated DesignLink and get these produced with the offered PCB fabrication service. This is just great!"

—Electronics engineer

Simulation of Communication Systems using IT++

JAI SACHITH PAUL

In this article, we would like to introduce you to a versatile C++ library called IT++. The library is composed of a handful of useful classes and functions in mathematics, communications and signal processing. Academicians and industrialists around the world, working on communications, make extensive use of this library. The generic vector and matrix classes contained in the kernel resembles the approach used in MATLAB/Octave.

IT++ runs quite comfortably in multiple platforms including GNU/Linux, Sun Solaris, Microsoft Windows (with Cygwin, MinGW/MSYS or Microsoft Visual C++) and Mac OS X operating systems (OSes). The latest release of this software (version 4.3.1) is incorporated in this month's EFY Plus DVD.

Simulating communication systems

The main motivation behind the introduction of IT++ library is to provide users with the functionalities that help them in modelling communication systems.

Modulators. An analogue modulator transfers an analogue-baseband signal over an analogue-bandpass channel. Various analogue-modulation schemes like quadrature amplitude modulation (QAM) can be implemented using IT++.

The digital modulator transfers a digital bit stream over an analogue-bandpass channel. Binary phase shift keying (BPSK) and other digital modulation schemes are included in the software.

The pulse modulator transfers a narrowband-analogue signal over a wideband-baseband channel. Schemes like pulse amplitude modulation (PAM) are provided in the library.

Vector modulators including orthogonal frequency division multiplexing (OFDM) and multiple input and multiple output (MIMO) are incorporated. The design of multi-user communication systems is aided by code division multiple access (CDMA) and OFDM modulation techniques.

```
#include <itpp/itcomm.h>

using namespace itpp;

//These lines are needed for use of cout and endl
using std::cout;
using std::endl;

int main()
{
  //Scalars
  int N;
  double N0;

  //Vectors
  bvec bits, dec_bits;
  vec symbols, rec;

  //Classes
  BPSK bpsk;  //The BPSK modulator/debodulator class
  BERC berc;  //The Bit Error Rate Counter class

  //Init
  N = 500000; //The number of bits to simulate
  N0 = 1;     //0 dB SNR

  //Randomize the random number generator
  RNG_randomize();

  //Generate the bits:
  bits = randb(N);

  //Do the BPSK modulation
  bpsk.modulate_bits(bits, symbols);

  //Add the AWGN
  rec = symbols + sqrt(N0 / 2) * randn(N);
```

A sample code in IT++

Software at a Glance

Name of the tool: IT++
Type: C++ library for communication systems
Licence: GNU general-public licence
Latest release: Version 4.3.1
Website: *itpp.sourceforge.net*
Packages it can be interfaced with: Blas, Lapack and FFTW *(optionally with Atlas, MKL and ACML)*

Pulse shaping filters. In order to adapt the transmitted waveform more to its original purpose or to make it suitable for the characteristics of the transmitting channel, waveform of the transmitting pulses needs to be altered. Raised cosine (RC) filter, a widely-used pulse-shaping filter with an inherent ability of minimising inter-symbol interference (ISI), could be implemented using IT++. Root raised cosine (RRC) filter is yet another pulse-shaping technique widely used in mobile communication.

Transmission through a channel. Once a codeword representing the source message is formed, it can be transmitted through a channel. The channel could either be a binary symmetric channel (BSC) or additive white Gaussian noise (AWGN) channel. For transmission through a BSC, the effect of Gaussian noise is not considered. Instead, each bit received differs from the bit sent by an error probability, p.

When we consider AWGN channel, data received at each time equals data sent plus Gaussian noise with mean zero and some standard deviation.

Both these channels can be modelled using IT++

Multi-path fading. When a signal is transmitted through a wireless medium, it propagates through multiple paths before reaching the antenna. Fading occurring in this path could either be frequency-selective or frequency-flat. If the channel's coher-

ence bandwidth is greater than the signal's bandwidth, it is frequency-selective. On the other hand, if the bandwidth of the signal is greater, then it is flat-fading. Both can be simulated using the tool.

Pathloss models. When a signal is transmitted, attenuation on the signal increases as it propagates through space. Attenuation thus produced, termed as pathloss, is a major component in the design of the link budget in a communication system.

Using the software, the designer can make use of various pathloss models like COST 207, COST 257 and ITU model for coverage prediction.

Error detection and correction codes. These are used to ensure reliable delivery of digital data sent over communication channels. Various error detection and correction schemes like Hamming, extended Golay, cyclic redundancy check codes, BCH, Reed-Solomon codes and more can be implemented using this tool.

Complementary functionalities

Ranging from mathematical functionalities like random number generation to features including fast independent component analysis (ICA) in signal processing and OFDM in communications, the library includes a lot of functionalities in order to complement the communication system design. Let us take a quick glance at some of these.

Math functions. The library consists of modules for handling basic mathematical functions such as hyperbolic, logarithmic and exponential function. IT++ also supports numerical integration and trigonometric functions. Various matrix operations such as finding the determinant, determining the inverse of a matrix or matrix decomposition can be done using the library. The module can also be used for solving linear equation systems.

Generation of random numbers, a much-demanded mathematical functionality in communications, is achieved using Mersenne Twister generator. Integration of single-dimensional functions and the unconditional non-liner optimisation using Quasi Newton search are also provided.

Signal processing. A communications engineer has to deal with signal processing at different levels. Various filter functions and classes are defined in this library. A lot of transformations used in time-frequency domain conversions are available in this library. This includes Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT) and much more.

The library can also be used for windowing and filtering operations, both in time as well as frequency domain. It can be used for evaluation of the roots of polynomials as well as for fast ICA.

Protocol simulation. Various event based simulation classes, queue classes, Transmission Control Protocol (TCP) clients and servers, packet generators, selective repeat automatic repeat request (ARQ) and others have been implemented.

Source coding. IT++ allows the user to read and save different audio file formats. Images can be read and saved in Portable aNy Map (PNM). Scalar and vector quantiser classes are provided.

The complimenting software

In order to improve performance, the tool makes use of external software. The tool can work even without these, but with its functionalities limited. Let us have a look at some of these.

Basic Linear Algebra Subprograms (BLAS). Standard building blocks required for performing basic vector and matrix operations are provided by this software.

Linear Algebra PACKage (LAPACK). LAPACK has software routines for solving systems of simultaneous linear equations, least-squares solutions of linear systems of equations, eigen value problems, and singular value problems.

Fastest Fourier Transform in the West (FFTW). This C sub-routine library can be used for computation of Discrete Fourier Transform (DFT) in single or multi dimensions. We can use FFTW for finding DFT for inputs of arbitrary size as well as for real or complex data.

You can find all these software bundled in the CD accompanying this month's EFY Plus.

What users feel

Most users who reviewed the software have been using this tool for simulation of communication systems. It works comfortably with various OSes. In comparison with other competing software like Armadillo, users feels that many signal-processing tools present in IT++ are missing in competing software. IT++ uses its own binary format, but these offer a MATLAB script to read data. "I thought IT++ had a little steeper learning curve than Armadillo but it was also quite good to use and very easy to install, at least in Ubuntu, where it comes as a package," says a user.

There are some users who are not so comfortable with this tool because of its dependencies. "Easy to install is one of my concerns since users may not be as geeky as the code writer and they may easily give up evaluating my code just because installation is not as smooth as they expected. So IT++ is ruled out by this criterion for its many dependencies," points out a user.

Fostering research in communication

Earlier research on this software was carried out in Department of Information Theory at Chalmers University of Technology, Gothenburg, Sweden. This, along with the fact that the library is coded in C++, gave the software its name.

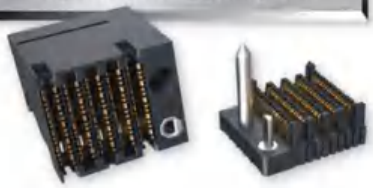
The software has emerged over the years, finding significant applications in all areas of communication. Nowadays, the tool is even used in machine learning and for pattern recognition. Why not give it a try? ●

The author is an electronics enthusiast from Kerala

DESIGNING THE FUTURE OF TECHNOLOGY

Booth 7B59

ExaMAX® 56Gb/s High Speed Backplane Connector System



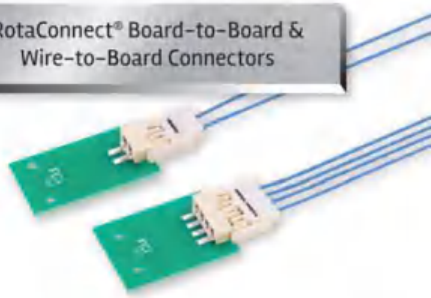
Millipacs® 10Gb/s High Speed Backplane Connector

Leap™ 300G On-Board Transceiver

SFP+ Active Optical Cable (AOC)

PwrBlade ULTRA® & PwrBlade+™ Connector System

RotaConnect® Board-to-Board & Wire-to-Board Connectors



PCB Terminal Blocks

Fiber To The Antenna (FTTA) Cable Assembly

BarGuide™ Connector

Visit our booth at **Electronica India 2015** to learn more about our new products and solutions.
Date: 9 – 11 September 2015
Venue: Pragati Maidan, New Delhi, India
Booth No.: 7B59

FCI

For more information, please contact us at:
FCI OEN Connectors Ltd
Thykoodam, Vyttila, PB 1958, Cochin 682019 Kerala, India
Tel: +91 484 2303 027/028 **Email:** fci.oen@fci.com

www.fci.com

Bangalore Mob: +91 99720 95792
Chennai Mob: +91 80561 40935
Delhi Mob: +91 98181 80682
Kerala Mob: +91 98957 09595
Pune Mob: +91 95451 66662
Vadodara Mob: +91 99986 39696

INDUSTRY NEWS

Government extends M-SIPS by five years

The government has extended the special incentive package for electronic manufacturing in India by five years, a move aimed at giving a boost to Prime Minister Narendra Modi's Make in India campaign.

The package, called M-SIPS (modified special incentive package scheme), has been sweetened by including 15 new product categories to the list. Smartcards, liquid crystal modules, consumer appliances such as refrigerators, ACs, microwaves and optical fibre are some new categories.

The package subsidises capex by 20 per cent for investments in SEZs and 25 per cent for projects outside SEZs. It also provides for countervailing duties/excise for capital equipment for non-SEZ units.

Further, reimbursement of central taxes and duties is provided for high technology and high capital investment units. The government has now made it easier to receive benefits, with disbursement of incentives on happening on a quarterly basis as against annually earlier. It has also extended M-SIPS for units located in any part of the country. The incentives will now be allowed from the date of submission of application.

Maharastra traders with turnover below ₹ 500 million exempt from paying LBT

With effect from August 1, 2015, Maharashtra government has exempted traders with a turnover of less than ₹ 500 million from paying Local Body Tax (LBT) to any of the 25 municipal councils.

The government has made a budget provision of about ₹ 20 billion to compensate the municipal corporations. The exemption will benefit 808,391 traders out of a total 809,553 registered ones.

In Focus

Appointments at Accenture in India

Accenture has announced that Rekha M. Menon will be chairman of Accenture and Anindya Basu will be country MD, both in India. These appointments are effective August 21, 2015.

Ravinder Zutshi joins Optiemus Infracom as MD

Ravinder Zutshi, who was deputy MD at Samsung India till December last year, has joined smartphone distribution firm Optiemus Infracom as managing director.

YV Verma Joins Videocon as consultant

YV Verma, who was director for home appliances business at LG India till two years ago, has joined Videocon as a part-time consultant to help fine-tune the company's human resource strategy.

Canon India promotes Andrew Koh as VP

Canon India has promoted Andrew Koh to the post of VP for its Consumer Imaging and Information Centre. Koh has spent 18 years with Canon and was senior director of Image Communication Products Centre for camera products.

Qualcomm appoints Sunil Lalvani as India head

Qualcomm Inc. has appointed former BlackBerry India head, Sunil Lalvani, as VP and president of Qualcomm India, as Avneesh Agrawal, senior VP and president of Qualcomm India and South Asia exits the company.

Consumer electronics industry to hit US$ 20.6 billion by 2020

India's appliance and consumer electronics sector is set to grow at a compound annual rate of 13.4 per cent to touch US$ 20.6 billion by 2020, according to the report that was released jointly by EY and Consumer Electronics and Appliances Manufacturers Association (CEAMA).

The report also mentioned that the market was worth US$ 9.7 billion in 2014, and the annual growth rate was 9.7 per cent. Within consumer electronics, set-top boxes are seen as the fastest growing category, at 28.8 per cent year-on-year, primarily because of the government's digitisation initiative.

From just 18.4 million units in 2012, the set-top box category is expected to reach 39.4 million in 2015, while there will be about 45 million units of replacements over the next four years as India gets digitised.

The television category is projected to grow at 20 per cent year-on-year between 2014 and 2020, followed by refrigerators at 10 per cent, washing machines at eight per cent to nine percent and air-conditioners at around six per cent to seven per cent.

India to emerge as No. 3 in creative imaging field

According to Nikon India MD, Kazuo Ninomiya, India is expected to emerge as the world's third largest in terms of revenue generation in the field of creative imaging over the next five years. About five years ago, India was ranked 15th in the world in this sector.

Ninomiya was speaking in the steel city to launch the first COOLPIX zone here. He was accompanied by vice president (imaging division) of Nikon India, Sajjan Kumar.

He also said that the company is looking at 30 per cent to 50 per cent growth in its turnover in the next five years.

CeBIT ties up with CLIK to boost ESDM sector in Karnataka

CeBIT India 2015, organised by Hannover Milano Fairs India Pvt

Calendar of Forthcoming Electronics Fairs/Exhibitions/Seminars/Events

Name, Date and Venue	Topics	Contact address for details
Embedded Systems Technology Forum September 2-4, 2015 NIMHANS Convention Centre, Bengaluru	A conference and exhibition that caters to the requirement of the electronics engineering community in India	dmg events Email: aneesahmed@dmgeventsme.com Website: www.estf.in
IFA Berlin September 4-9, 2015 Berlin, Germany	World's leading trade show for consumer electronics and home appliances	Messe Berlin GmbH, Messedamm 22 Phone: +49-30-3038-2217 Email: vonderropp@messe-berlin.de Website: b2b.ifa-berlin.com
electronica India productronica India September 9-11, 2015 Pragati Maidan, New Delhi	Fair for electronic components, systems, applications and entire value chain in electronics production, besides communication platform for the electronics industry	MMI India Pvt Ltd Phone: 9967558496 Email: kavita.chhatani@mmi-india.in Website: www.electronica-productronica-india.com
IT ASIA 2015 September 25-27, 2015 Hitex, Hyderabad, Telangana	An India international exhibition and conference on electronics and ICT industry	Aakar Exhibition Pvt Ltd Email: sanjay@mait.com Website: www.itasia.in
Safety & Security Asia 2015 Singapore September 29 – October 1, 2015 Marina Bay Sands, Singapore	One of the largest international safety and security technology and equipment exhibition	Conference & Exhibition Management Services Pte Ltd Phone: +65 62788666 Website: safetysecurityasia.com.sg
Taitronics 2015 October 6-9, 2015 TWTC Nangang Exhibition Hall No.1, Nangang District, Taipei, Taiwan (R.O.C.)	Electronic components and parts, meters and instruments, LED lighting and applications, power supplies, industrial process and automation, smart living and consumer electronics, broadband products and cloud	TAITRONICS 2015 (41st Taipei International Electronics Show) Website: www.taitronics.tw
19th electronicAsia October 13-16, 2015 Hong Kong Convention and Exhibition Centre, Hong Kong	Showcasing the newest electronic products, components and technologies	MMI Asia Pte Ltd Website: www.electronicasia.com
Gizworld Wearable Tech and IoT SF conference October 27, 2015 Santa Clara Convention Centre, Santa Clara, California, the USA	Over 20 dynamic TED-style keynotes, 50 fast-track start-up pitches, product demos and unique networking opportunities	Gizworld Wearable Tech and IoT SF Website: gizworldconf.com/san-francisco
CeBIT India October 29-31, 2015 BIEC, Bengaluru	A digital marketplace to understand what new technology can do for a business	Hannover Milano Fairs India Pvt Ltd Phone: +91-22-66875527 Website: www.cebit-india.com
Intersolar India November 18-20, 2015 Bombay Exhibition Centre (BEC), Mumbai	India's largest exhibition and conference for the solar industry	Intersolar India Website: www.intersolar.in
OSI Days 2015 November 19-20, 2015 Nimhans Convention & Exhibition Centre, Bengaluru	Open source conference that aims to nurture and promote the open source ecosystem in Asia	EFY Enterprises Pvt Ltd Phone: 011-26810601/2/3 Email: info@osidays.com Website: www.osidays.com
LED Expo 2015 December 3-5, 2015 Pragati Maidan, New Delhi	Country's No. 1 exhibition on LED lighting products and technologies	Messe Frankfurt Trade Fairs India Pvt Ltd Phone: 022-61445900 Website: www.theledexpo.com
Energy Storage India December 8-9, 2015 India Habitat Centre, New Delhi	International conference and exhibition on energy storage and microgrids in India	Customised Energy Solutions Website: www.esiexpo.in
WIN India December 9-11, 2015 Pragati Maidan, New Delhi	From hydraulics and pneumatics to electro-mechanical transmission, automation components to process and factory automation systems, among others	Hannover Milano Fairs India Pvt Ltd Phone: 9167522998 Email: nikhil.desai@hmf-india.com Website: www.win-india.com
India Electronics Week January 11-13, 2016 Bengaluru	An Indian exhibition for the global electronics industry showcasing concurrently five events: Electronics For You Expo, Electronics Rocks, T&M India, LED Asia and IoT Show	EFY Enterprises Pvt Ltd Phone: +91-11-40596605 Email: growmybiz@efy.in
WEARABLE EXPO January 13-15, 2016 Tokyo Big Sight, Tokyo	Wearable device and technology expo	WEARABLE EXPO Show Management Reed Exhibitions Japan Ltd Website: www.wearable-expo.jp/en
ELECRAMA 2016 February 13-17, 2016 BIEC, Bengaluru	Serves the business needs of utilities, government, EPC consultants, contractors, electrical equipment manufacturers and generation companies	ELECRAMA 2016 Email: anil.nagrani@ieema.org

Look up under 'Events' section in www.electronicsforu.com for a comprehensive list

Since this information is subject to change, all those interested are advised to ascertain the details from the organisers before making any commitment.

Ltd, has partnered with Consortium of Electronic Industries of Karnataka (CLIK), to boost the electronic system design and manufacturing (ESDM) sector in the state.

CeBIT, to be held from October 29 to 31, 2015, at Bangalore International Exhibition Centre (BIEC), Bengaluru, will provide a global platform for MSMEs to showcase their innovations at the CLIK pavilion.

This collaboration would further promote growth in the ESDM sector and provide newer forays for collaboration between member MSMEs, government and service providers, as well as encourage global investment in the state.

Government announces EDF of ₹ 100 billion

The government has said that the electronics development fund (EDF) will become operational from September onwards to support venture capitalists to fund electronic manufacturing in general and LEDs in particular.

Ajay Kumar, additional secretary, Ministry of Communications and Information Technology, has said that the fund would be totally market driven, depending upon the involvement of venture capitalists.

NASSCOM partners with HARTRON

National Association of Software and Services Companies (NASSCOM) has partnered with Haryana State Electronic Development Corp. Ltd (HARTRON). The collaboration is aimed at establishing a start-up warehouse in Gurgaon. NASSCOM has signed an MoU with HARTRON to take this alliance further.

The partnership is another important step taken by NASSCOM for its 10,000 start-ups initiative. The first start-up warehouse in Haryana is expected to be functional within the next three months, accommodating close to 85 workstations initially and the occupancy will be expanded in a phased manner.

Snippets

MoU signed for EMC

Uttar Pradesh Development Systems Corp. Ltd and Taiwan Electrical and Electronics Manufacturers Association (TEEMA) have signed an MoU for setting up an electronics manufacturing cluster (EMC) on a 210-acre plot in Greater Noida, Uttar Pradesh. In the first phase, Taiwanese units will invest ₹ 5 billion.

Shilpi Cable Technologies to foray into lighting

Shilpi Cable Technologies has plans to enter lighting market as part of its plans to raise sales to US$ 1 billion by 2020. The company would enter the LED lighting vertical under the brand Safe.

Resolute Electronics to make Thomson products

EMS company Resolute Electronics India will invest ₹ 3 billion on its Medchal facility, to manufacture and market Thomson brand LED televisions and large home appliances. LED TVs will be the first to roll out of the facility under an exclusive licensing agreement with Technicolor S.A., the firm behind Thomson brand.

Aricent acquires SmartPlay

Aricent has acquired SmartPlay Technologies, a fast-growing product engineering services firm. The acquisition establishes Aricent as the top product engineering services firm in the semiconductor market.

electronicAsia to return in October 2015

The 19th electronicAsia is being co-organized by MMI Asia Pte Ltd and Hong Kong Trade Development Council (HKTDC), concurrently with the 35th Hong Kong Electronics Fair. It will return this year with over 4100 exhibitors showcasing the newest electronic products, components and technologies to the world of buyers.

Asus aims to increase market share to five per cent

Smartphone maker Asus is planning to establish a manufacturing unit in India and has set up an internal team to study the prospects of domestic manufacturing. The Taiwanese firm, which currently has a share of about two per cent in the Indian smartphone market, aims to expand it to five per cent by next year.

China's Leyard Optoelectric to invest in MIC Electronics

MIC Electronics Ltd has approved China's Leyard Optoelectric Co. Ltd's proposal to invest ₹ 1.25 billion in the company through purchase of equity shares and convertible preferential share warrants. The company said that the synergy between Leyard and MIC is expected to create a strong design and manufacturing base of LED products in India.

NTL Lemnis to raise its capacity of LED lamps

NTL Lemnis is more than doubling its production capacity of LED lamps as it ventures in to modern retail. The company, which supplies to institutional clients such as PepsiCo, HIL and JSW Steel, recently launched Pharox LEDs for the Indian market.

NTL Lemnis was the first company to introduce LED lamps in the Indian sub-continent in 2009. It supplied four million units of LED bulbs to IKEA for the latter's European customers in 2011-12.

The ₹ 45 billion Indian LED industry is growing 48 per cent year-on-year, led by the likes of Syska and Philips.

STPI developing electronics incubation centre in Visakhapatnam

Software Technology Parks of India (STPI) is planning to develop an ESDM incubation centre with the assistance of the central government in the port city. The centre is aimed at promoting entrepreneurs in the electronics sector for which India is mainly dependent on countries such as China and Taiwan.

STPI is also holding discussions with Visakhapatnam Urban Development Authority (VUDA) to construct an IT tower to focus on marine, power and telecom in the city adjacent to the VUDA building at Siripuram.

Foxconn to invest US$ two billion push to Make in India

Foxconn Technology Group is set to invest over US$ two billion initially to establish manufacturing plants in India over the next five years to produce mobile devices, TVs, electronic products, batteries and key electronic components, among others, which could make it the biggest foreign investor in the government's Make in India programme so far.

The company is also planning to set up one or more data centres and some fab units over the next 10 years.

Taiwan EMC to open in Bengaluru

Taiwan Electrical and Electronic Manufacturers' Association (TEEMA) has signed a pact with Karnataka Industrial Areas Development Board (KIADB) for establishing Taiwan Electronic Manufacturing Cluster (TEMC) in Bengaluru, with an investment of US$ 500 million.

TEEMA will also set up a training and incubation centre in IT park with focus on providing employment to more than 20,000 to 30,000 people once the TEMC becomes operational.

Lenovo-Motorola starts making smartphones at Chennai plant

China's Lenovo has started local manufacturing of its smartphones at Sriperumbudur near Chennai, through a contract manufacturer. Lenovo, which also owns Motorola Mobility, has already started rolling out two 4G variants of Moto E smartphone from the plant, and will start making another 4G device, Lenovo K3 Note, soon.

The company said that both Lenovo and Motorola will have separate manufacturing lines at the same facility. The plant will house 1500 employees for manufacturing lines, quality assurance and product testing.

The current capacity of the plant is six million units for the current financial year. The plant is the only plant outside China that will manufacture smartphones for both the brands.

Scientech Smart Solutions

Exploring Possibilities Beyond Technology

Smart Lighting

Smart Transportation

Smart Campus

Smart Agriculture

Over a past few years the world has witnessed more products connected to the Internet rather than people. We can now interact not only between ourselves, but with real objects. Scientech believes that the new Internet of Things requires an open platform capable of dealing with different technologies, communication protocols and sensors. Scientech Smart Solutions for Smart Cities, Smart Environment, Smart Buildings, Smart Factories, Smart Agriculture, Smart Logistic, Smart Education, and Smart Homes will contribute to make this planet a better place to live.

Come be a part of this exciting future.

Write to us at **sthakare@scientech.bz,** or call us at **+91 9755591500**

Scientech Technologies Pvt. Ltd.
94, Electronic Complex, Pardesipura, Indore-452010, India.
✆ +91-731-4211100, ✉ info@scientech.bz, www.ScientechWorld.com

Counterfeit Components and Their Impact

S.A. Srinivasa Moorthy is director, D4X Technologies Pvt Ltd, Chennai

Counterfeiting ranges from exact copies of whole products to replicas of electronic components. With the increasing need for components, counterfeiters are becoming sophisticated and are using advanced techniques to counterfeit. Fig. 1 shows what all are getting affected by counterfeiting.

With increased outsourcing of both ICs and product manufacturing, original equipment manufacturers and original component manufacturers have lesser control over the manufacturing process, which is leading to the proliferation of counterfeit components/products in the market.

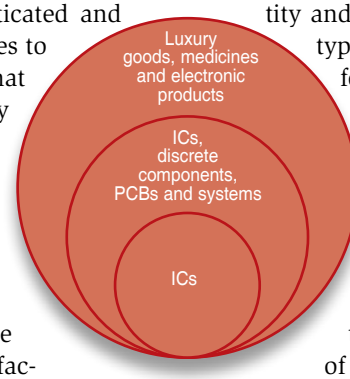


Fig. 1: The products and components affected by counterfeiting

Types of counterfeits

Counterfeits are classified by the way these are fabricated and fall into the following categories:

Recycled. Devices that are pulled out of discarded printed circuit boards (PCBs), which are sent for recycling, are modified in such a way that these look like new ICs, which are then sent out for sale.

Re-marked. Each semiconductor is marked in a unique way in order to identify its function, data it contains, place of manufacture, part identification number, manufacturing batch number, date code and electrostatic discharge sensitivity code. Normally, MIL- and space-grade products carry a higher price tag. Counterfeiters mark the regular commercial parts as MIL grade or space grade, and sometimes industrial grade, and sell these at a higher price.

Over-produced. With increased proliferation of fabless semiconductor vendors (IC manufacturers who do not own a foundry and use a third-party foundry for manufacturing the ICs, and are very similar to electronics manufacturing service (EMS) vendors), foundries that manufacture ICs produce more than the required quantity and sell these in the market. This typically happens with unreliable foundries. Fig. 2 shows the leakage points where devices can leak out of the system and get into the market.

Rejected or defective. Counterfeits that fall into this category are devices that are rejected in one of the test stages in the manufacture of an IC, as shown in Fig. 3.

A typical semiconductor has three stages of testing: first, at wafer level, second, when the device is packaged and third, during final testing. Any device that fails any one of the three test stages is rejected and sent for destruction. The failure could be from downright dead devices to devices that fall outside test specifications. Counterfeiters pick up these rejected items and sell these back to the market as good parts.

Cloned. With increased use of third-party-developed IP cores (codes/circuits that are tested and available in a reusable format), cloning has become quite easy. Typically, cores are licensed for a fee and chip designers integrate these into their designs. Counterfeit manufacturers use the IP core in their devices without paying the licence fee to the developer and get the ICs manufactured.

In addition, when complexity of ICs is low, some counterfeiters just reverse-engineer the whole IC and clone it or copy it. Detection of clones is a challenge as in most cases these function like the originals.

Forged documentation. Another type of counterfeits tamper the documentation that is sent along with the ICs when shipped

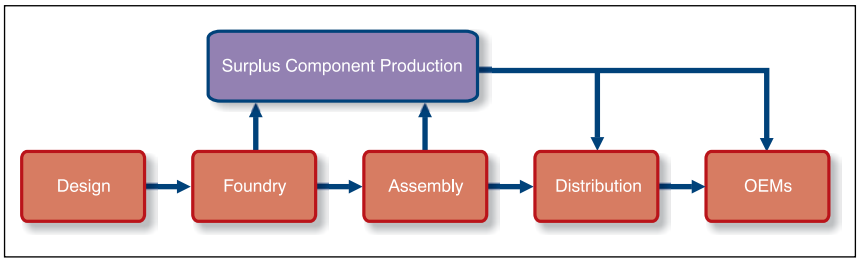


Fig. 2: Leakage points where devices can leak out of the system and get into the market

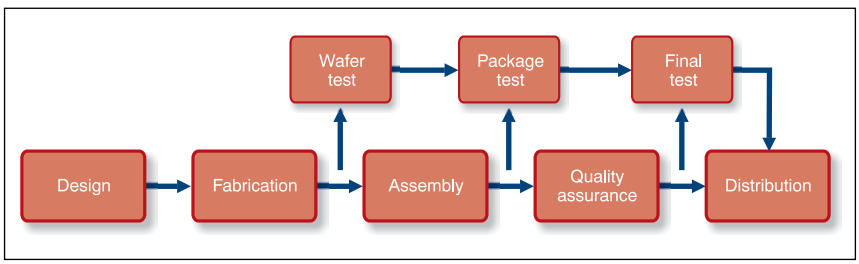


Fig. 3: Devices that are rejected in one of the test stages in the manufacturing of an IC

from factories. By forging documentation, devices can be up-marked (represented as a higher specification part) and sold at a higher price. A good example is to mark a commercial-grade part as industrial-grade.

Defects found in counterfeits

There are two types of defects: internal or invisible defects and external or visible defects. Internal defects are generally called package defects, whereas external defects are further classified into two categories:

Procedural defects. These mainly relate to the packaging and shipping of components and their markings

Mechanical defects. These are due to structural deficiencies and can be further classified as:

Leads/balls/columns. Damages found in leads of different IC packages

Package dimensions and type. Deviations in the IC package from standard packages as defined by JEDEC standards

External defects occur due to reuse of devices, processes used in getting the devices ready for reuse, especially while pulling out of PCBs.

Internal defects are not visible and are invariably associated with the internals of ICs, which could have happened either in the foundry or at the package-assembly stage.

When ICs are manufactured, the die is attached to wire frames. Depending on the design parameters, designers use either a single wire or two wires for bonding the die to the leads. Most counterfeit ICs have either one or both these burnt due to usage.

Another internal fault is the damaged die inside ICs. This happens either due to the process or delamination. At this stage, we need to remember that a counterfeit may not be functional.

Detecting counterfeits

Detection of counterfeits is a time-consuming and intensive process. Proper supply chain checks need to be in place for detecting counterfeits early on in the process; detecting these just as these enter the inventory is the best way to avoid problems.

There are several tests that could be performed to detect counterfeits.

First is a physical test, using incoming inspection or an automated image-recognition system for inspecting the information printed on the package.

Second is a destructive test in which samples are physically destroyed to find counterfeits.

The third uses sophisticated tests like X-ray spectrometry or material analysis for accurate detection.

Another type of detection involves electrical parameter testing. These tests either check the electrical parameters or subject the counterfeits to burn-ins to check durability of parts. At times, all these tests are carried out to identify counterfeits.

How to avoid counterfeiting

Avoiding counterfeits is a tricky and expensive process. However, compared to the cost of the bad impact of counterfeits on products, a little price paid for avoiding is better in the long run. Avoiding counterfeit parts needs proactive and real-time actions.

First step is to control the supply chain so that the purchase process is robust, and all data of purchased components is logged and kept for future reference. This data is typically captured and kept when avionics and medical devices are manufactured. For other products, it is basically the manufacturing process that addresses this aspect.

Proactive avoidance mechanism in the design and manufacturing of ICs makes counterfeiting as difficult as possible. Proactive avoidance techniques include avoiding die and IC recycling (includes two methods of combating counterfeiting, namely, anti-fuse based avoidance and ring oscillator based avoidance), watermarking of ICs, physical unclonable functions and secure split tests.

Let us now see how counterfeiting is being tackled at design level.

Combating die and IC recycling (CDIR). Bulk counterfeiting happens at foundry and assembly locations, and there are two basic technologies that are used. First is anti-fuse/fuse based technology, which is similar to the technology used in programmable logic devices.

Essentially, when an IC with anti-fuse protection powers up, for a brief moment, the programmable logic is in read mode and the central processing unit (CPU) is able to read and verify the authenticity of the device by comparing it with the data supplied by the vendor. Since it requires programming

of each device, this technique is used for high-value ICs like CPUs, precision analogue-to-digital converters and graphics processing units.

For low-cost devices, the solution is a little more ingenious. Typically, a semiconductor fuse is introduced in the IC, which gets blown during testing. So if a counterfeit IC has been used, which could either be a recycled IC or counterfeit die, the blown fuse will indicate that the device is a counterfeit. Fig. 4 shows how this is implemented.

One risk to the above approach is that counterfeiters can easily crack current technologies, so more complex counterfeit-avoidance mechanisms should be used.

One method that is quite popular and difficult to crack is the ring oscillator based CDIR. In this design, as part of the IC, two ring oscillators are introduced; a ring oscillator is a circuit in which several inverters are connected in series and the output is connected to the input so that the circuit oscillates. One of the oscillators is such that it ages faster (so the frequency changes) than the other, so that as the ICs work, the frequency of oscillation will not be the same as it was when it was produced (which can be measured with the other oscillator, which is part of the IC).

IP copying. Another popular counterfeiting is the copying or unlicensed usage of IP cores. With an increase in pressure on time-to-market, most semiconductor designers use off-the-shelf IP cores, which are tested and proven, and can be included in the IC design directly as a library.

As a business practice, companies sell the core typically under licence to the user under trust. However, if the licensee uses it without the IP owner's licence, it becomes difficult for IP companies to track and prevent copying.

With increased sophistication in counterfeiting, protection of IP with advanced techniques has become a necessity. The most popular method is encryption, in which only when the

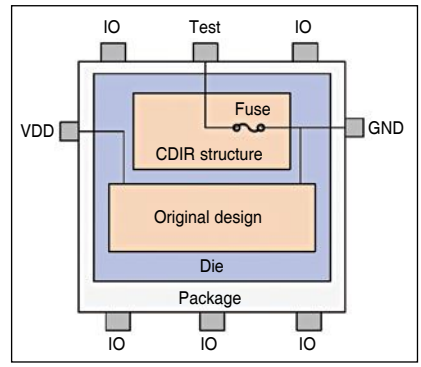


Fig. 4: Fuse status indicates if the device is a counterfeit

authorised key is used, the code is enabled. This works when the IP is in the form of hardware description language (HDL) codes. In case of a hard IP, where it is in the form of a proven module, other techniques need to be used.

A popular technique for avoiding counterfeiting is watermarking. Normally, watermarking impacts the item that is being watermarked, but in the case of IPs this is not desirable. So most watermarking is done either by using constraints (known way of doing things) or additive to hardware IP. This way watermarks are distinctly visible.

Another popular counterfeit-avoidance technique uniquely identifies the IC so that it can be traced back to the original chip manufacturer. This technique is known as physically unclonable function (PUF). It is close to the biometrics collected for human beings and is called silicon fingerprints.

PUF implementation depends on the fact that process variation happens during fabrication of ICs and each chip has a distinct identity. Silicon PUF is a circuitry that extracts random characteristics out of an IC and, using those, generates a unique signature. By using a challenge-response protocol, which is similar to challenge handshake authentication protocol and password authentication protocol used in networking, the signature can be extracted and compared with the response already collected during manufacturing.

The challenge and response bits are known as challenge-response pairs. Response bits are known as PUF signatures. Silicon PUFs have turned out to be a good antidote for counterfeiting.

PUF signatures are either delays caused by process variations or by using aging-resistant ring oscillators, which have a frequency difference due to process variation.

While this sounds easy, there are certain challenges in implementing this technology such as:

1. Getting a stable response over a widely varying environment
2. Implementing parts that are already in use
3. Taking care of implementation costs
4. Securely storing and maintaining the servers to store challenge-response pairs

Another technique that supplements this technique is encrypted QR codes on the packaging of the IC, which allow identification when decrypted with proper keys.

Finally, a popular technique that ensures that counterfeits do not leak from foundry and assembly locations is known as the secure split test, also known as connecticut secure split test (CSST).

In Fig. 3, we can see leakages when ICs get rejected after testing. To plug this, CSST is implemented, in which a structure is added to the IC and the test response is uniquely perturbed. This process is devised by the IP owner, who alone can examine the test result through a proprietary communication and decide whether the device is genuine or counterfeited. If the IC is genuine, the IP owner sends the key to open the lock to the foundry and only then the IC is usable. Using this technique, the problem of over production can be addressed by keeping track of the number of keys that are released.

This technique also prevents IP cloning as the IP can be opened only with the right key issued by the IP owner.

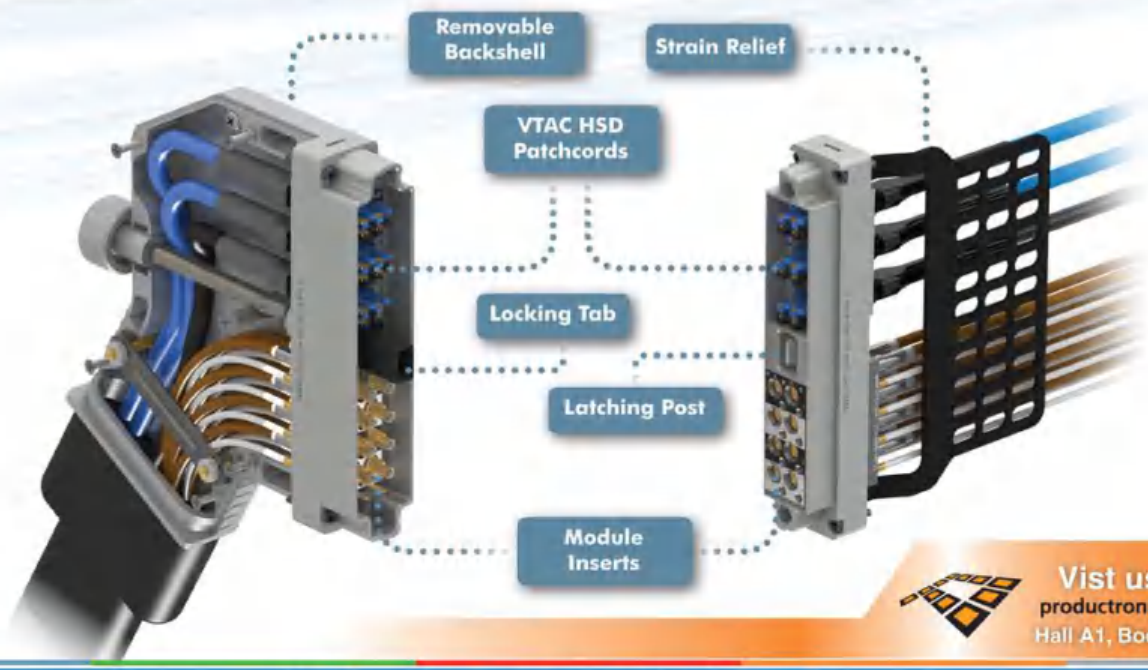
More Opportunities Than Ever With i2 MX

The i2 MX connector was engineered to retain the popular features of the i2 Micro iCon, while addressing the need of Electromagnetic Interference (EMI) shielding in the testing industry. The i2 MX also features the modularity and versatility of the iCon, offering a greater variety of I/O options and engineered for over 10,000 cycles.

FEATURES AND BENEFITS

- EMI-shielding minimizes unwanted noise and ensures signal integrity
- Oblong cable exit provides clearance for maximum cable bundle capacity and EMI-shielding
- Multiple I/O's supported: signal, coax, power, and high speed VTAC inserts (with more than 12.5 Gbps per differential pair)
- Easy access for trouble-shooting and maintenance with removable side panel on ITA backshell

For a complete list of i2 MX product offerings visit
vpc.com/i2MX



Vist us at
productronica 2015
Hall A1, Booth 159

Aerospace • Medical • Defense • Consumer Electronics • Automotive • Telecommunications • Energy • Industrial Automation

CONNECTED ORDER
creating order out of wiring chaos

VPC Virginia Panel Corporation
vpc.com

MARKET SURVEY:

An Outlook for the Indian Strategic Electronics Sector in Defence

Sudeshna Das is senior executive editor at EFY

The strategic electronics (SE) sector in India has the potential to become a sunrise industry in India over the next ten years. It is estimated to grow at a compounded annual growth rate (CAGR) of 20 per cent to 30 per cent. The sector accounts for six per cent to seven per cent of the overall Indian electronics market with the government as the sole buyer and market maker for defence electronics.

Contrary to the general perception, defence electronics has undergone a paradigm shift due to the participation of private players along with public sector undertakings (PSUs), even though a major part of the market is yet to be explored as the industry requires high-quality input materials, production processes as well as testing, and the right strategy to ensure participation of micro, small and medium enterprises (MSMEs) to increase Indian content in SE.

Opportunities galore

The SE sector offers unprecedented opportunities, more so in the defence sector. As per industry estimates, electronics production in the sector in India reached ₹ 120 billion during 2012-13 and exceeded ₹ 138 billion during 2013-14, recording a growth of more than 15 per cent.

As per The International Institute for Strategic Electronics Studies, India's defence capital expense quadrupled from US$ three billion in 2000 to US$ 12.2 billion in 2010, making it the sixth largest spender on defence worldwide during the same period. It is expected that India's US$ 12 billion defence market will continue to grow, and capital expenses are expected to reach between US$ 18 billion and US$ 20 billion.

India is the largest importer of defence equipment, importing thrice as much as China and Pakistan each. The volume of

Indian imports of major weapons rose by 111 per cent between 2004 and 2008 and again between 2009 and 2013, and its share of the volume of international arms imports increased from seven per cent to 14 per cent. Major suppliers of arms to India in 2009-13 were Russia (accounting for 75 per cent of imports) and the USA (seven per cent).

Large-scale modernisation of defence forces is on the anvil. The next decade is likely to see an exponential growth in combat systems as well as non-platform based SE programmes, with requirement for the 12th Plan (2012-2017) being pegged at over one trillion rupees. These would include:

1. Tactical communication systems
2. Battlefield management systems
3. Network-centric warfare systems
4. Future infantry soldier as systems
5. Tank electronics
6. Air defence systems
7. Avionics, navigation equipment, radar and sonar
8. Night-vision devices
9. Host of associated and embedded electronics

The 'Report of Working Group on Defence Equipment' estimates the requirement of defence electronics to be of the size of ₹ 257 billion. This amounts to about 25 per cent of the capital expenditure projections of the working group by 2016-17. Thus, looking from the offset perspective, opportunity for Indian electronics manufacturing is huge.

SE is a niche segment characterised by high-cost and sophisticated technologies. A solid base of research and development (R&D) is required in order to remain at the forefront. Department of Electronics & Information Technology (DeitY) holds essential expertise complemented by a sturdy infrastructure to undertake R&D activities in this pivotal sector. The key thrust area

Favourable government policies

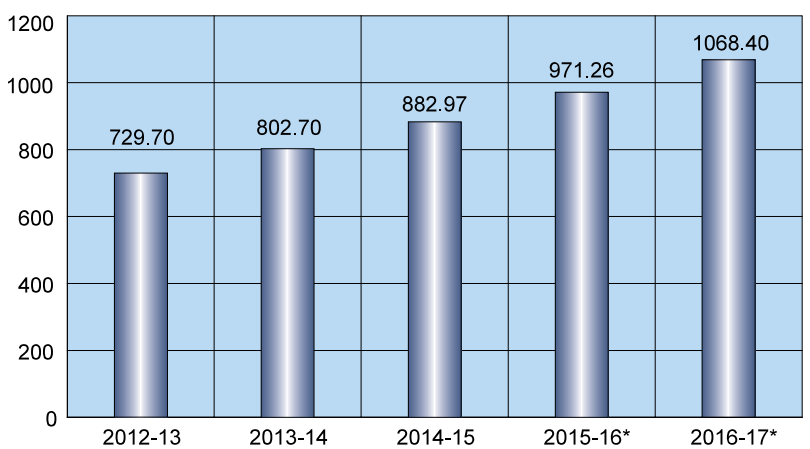
- The government has launched the Make in India initiative to promote manufacturing in the country. According to competitive assessment, 25 thrust sectors including manufacturing, relevant infrastructure and service sectors have been identified, spanning a number of administrative ministries and departments.
- Defence acquisition proposals worth more than ₹ 650 billion have been categorised under Buy (Indian) and Buy and Make (Indian).
- Various policy initiatives to promote and encourage entry into defence manufacturing have been put in place such as:
  - Cap on FDI in the defence sector increased to 49 per cent via approval route
  - To improve access to state-of-the-art technology, this cap can be increased even further with Cabinet Committee on Security (CCS) approval
  - Requirement of single largest Indian ownership of 51 per cent of equity has been removed. This has been a long standing demand from the domestic industry
  - Portfolio investments are now permitted up to 24 per cent in automatic route
  - Liberalisation of industrial licensing policy by taking out all component parts, raw materials, testing equipment, etc
- Companies planning to manufacture dual-use items no longer require industrial licences and will also not be subjected to FDI ceiling of 49 per cent.
- Initiatives for R&D investment through technology development fund and tax incentives have been initiated.
- Policies for the MSME sector have been enabled.

"Today, Ministry of Defence (MoD) aims to create conditions conducive for domestic manufacturers, both public and private, so that they can play an active role in the SE domain. We are aiming at expediting decision making, as well as simplifying contractual and financial provisions to establish a level playing field for Indian companies to compete with foreign firms."

— Rao Inderjit Singh, hon'ble minister of state for planning (independent charge) and minister of state, Ministry of Defence

Projected Defence Capital Expenditure

(₹ billion)



*Projections
Source: Indian Thirteenth Finance Commission Report, December 2009

Recommendation for creating a conducive environment for MSMEs in SE

Usefulness of policy interventions like offset norms and TPCR. Availability of TPCR and multiplier norms has the potential to improve MSME participation in the defence procurement process, under the provision of defence procurement offset norms. Offsets have increased participation of large integrators in defence procurement and the TPCR has also helped.

TPCR needs to give a realistic vision or roadmap. It should be more focussed on technologies leading to business opportunities and be able to give direction to an industry's R&D efforts.

Understanding offset norms. More clarity is required regarding offset norms, particularly in determining what is local and what is foreign. For example, offset norms emphasise the need to source from domestic vendors instead of supporting domestic manufacturing. So multipliers should not be calculated on the basis of value addition rather it should be done on the billing value of the Indian partner as import content of the Indian partner may exceed 80 per cent and go up to 90 per cent.

Stage-wise calculation of value addition makes it very difficult to calculate how much local value addition is possible. This process needs further study and clarity.

It is currently not possible to meet all component requirements of the manufacturing process through domestic sourcing. Thus, to make it more feasible for domestic companies to participate, there should be clarity on the manufacturing value chain and licences such as SCOMET and procedures to issue such licences should be simplified.

Ensuring participation of MSMEs. There is an urgent need to deal with the losses that MSMEs incur when pitching for defence contracts. Clauses such as no cost no commitment (NCNC) should not be applicable to MSMEs manufacturing in India. Cost of the prototypes must be paid to MSMEs.

Similarly, the study recommends certain indirect financial support to MSMEs. These include lowering the cost of capital, offering an interest subsidy, dealing with issues relating to payment delays, need for securities/guarantees, blockage of funds, etc. The study recommended establishing a mechanism or policy to cover various financial bottlenecks in order to help MSMEs focus on manufacturing and R&D.

Other recommendations include setting up a development fund for select MSMEs, establishing a smoother procurement process for them to participate in tendering and promoting greater collaboration among MSMEs on projects. Another important recommendation is the need to review investment limits that define MSMEs as given in the MSMED Act 2006 and its Amendment needed to be inflation-adjusted.

Procurement. There are a number of recommendations to simplify the procurement process. These relate to identification of Indian offset partners (IOPs) by foreign companies, delay in finalising contracts resulting in technology obsolescence caused by the time lag between tendering and actual procurement, participation of the financial advisor and other decision makers in the procurement process, applicability of same import duties, central excise and sales tax (local taxes) for all vendors, demand for bank guarantees and requirement for detailed drawings from all vendors foreign or domestic, among others. All these issues need to be addressed.

Payment terms. The Indian private sector needs to be treated at par with DPSUs, ordinance factory board (OFB) units and foreign vendors. The private sector should have the same terms for payments and cost comparisons including applicable taxes and foreign exchange variations. Currently, preferential treatment is given to foreign companies. Domestic vendors must also be paid on the same terms applicable to foreign vendors, or through banks, where payments are tied to performance and not delayed due to procedural issues. Delays in payment should attract payment of interest to vendors.

Common ground as DPSUs. Private companies are seeking a level playing field, as is provided to DPSUs. Areas of concern include deals where transfer of technology is negotiated, taxation patterns for DPSUs vis-à-vis private companies, treatment in open tenders and transfer of technology from DRDO.

(Source: ELCINA study on Opportunities and Challenges in Strategic Electronics in Aerospace & Defence Sector with Focus on MSMEs, which was supported by EFY as research partner)

is to develop state-of-the-art technology for designing, developing and upgrading mission-critical systems in defence and civil domains.

R&D labs and institutes of higher learning are restructured with state-of-the-art technology and infrastructure. The primary goal is to cater to the strategic needs of the sector essentially for the indigenisation of products as well as technologies, getting rid of hindrances in terms of unavailability of advanced technology and propel growth in this segment.

Electromagnetic wave applications, intelligent sensors, RFIDs, micro-robotics, intelligent materials, microelectronics systems, micro systems for manufacturing nano-materials, convergent technologies (nano-bio-infro-cogno-socio), deep space and others are some of the newest technologies being promoted.

Defence procurement: Key growth driver

"Today, Ministry of Defence (MoD) aims to create conditions conducive for domestic manufacturers, both public and private, so that they can play an active role in the SE domain. We are aiming at expediting decision making, as well as simplifying contractual and financial provisions to establish a level playing field for Indian companies to compete with foreign firms," says Rao Inderjit Singh, hon'ble minister of state for planning (independent charge) and minister of state, Ministry of Defence.

Defence procurement in India is

> **"Many a time, Make in India in defence boils down to replacing entire assembly shops of ToT in DPSUs with joint ventures or private sector assembly shops."**
>
> — Rahul Chaudhry, CEO, TATA Power SED

undertaken by Ministry of Defence under two heads: capital procurement and revenue procurement. Capital procurement of new equipment is governed by Defence Procurement Procedure 2013 (DPP 2013) while revenue procurement is dealt by Defence Procurement Manual 2009 (DPM 2009).

Government initiatives such as Defence Offsets and Defence Procurement Policy have opened a host of opportunities for industry players to gain from greater domestic value addition and indigenisation, respectively. Offsets have the flexibility in fostering partnerships with foreign majors and reduce the country's heavy dependence on imports.

Post-independence, the defence industry in India was placed under the reserved list, thus entitling only state-owned companies to participate in defence production, which included nine defence PSUs (DPSUs), 39 OFs and 50 plus DRDO labs. The sector was opened to private sector in 2001 with a restrictive 26 per cent FDI cap. The FDI policy has, however, now further liberalised to an FDI cap of 49 per cent in 2014.

> **"We have empanelled 146 private players as our partners in defence R&D and 64 of them are MSMEs. We have specific vendor development programmes under which we conduct training especially for quality improvement, as quality plays a critical role in defence electronics."**
>
> — Philip Jacob, executive director D&E, Bharat Electronics Ltd

A technology perspective and capability roadmap (TPCR) based on a long-term integrated perspective plan (LTIPP) has been issued to the industry to help plan its R&D and infrastructure creation. Based on the approved LTIPP, equipment, weapon systems and platforms required in the coming years are expected to be developed/integrated/made within the country. Sub-systems/equipment/components may be imported, ensuring their availability at all times but design and integration of the platform/TPCR system are likely to be undertaken within the country.

Provisions have been made in DPP 2013 as well as DPM 2009 to support participation of MSMEs in the procurement process, particularly multiplier norms that provide steady business to them.

DRDO has issued a list of critical technologies to be developed or acquired. There may be a few Indian companies that could potentially pick up a few of these. This opportunity

"Hand-holding and guaranteed buying programmes along with allocation of development fund by the government for select MSMEs on the basis of their capacity and expertise in the defence segment will be helpful for the SE industry. This selection can be done through defence RFI procedure."

— N. Ramachandran, managing director, MEL Systems

would also come to Indian companies in the shape of offsets as DRDO may source these from foreign OEMs.

In addition, DRDO has also come out with guidelines for transfer of technology (ToT) to the Indian industry and these will be made available to the industry at a small fee. This could be an opportunity as high as one trillion rupees or more, since most of the technologies fall in the SE domain.

The defence procure procedure is being refined continuously to create a level playing field between the private and public sector, and to expedite the procurement process as a whole. The current DPP 2013 is under review and a committee of experts has already submitted (July 2015) its final report to the defence minister. Currently, the emphasis is on giving a boost to the Indian defence industry, both in the public and private sector, by according a higher preference to Buy (Indian), Buy and Make (Indian) and Make (Indian) categorisation, bringing further clarity in the definition of Indian content and simplifying Buy and Make (Indian) procedure.

These amendments have seen an expansion of the categorisation process from only Buy cases to Buy and Make through ToT, Buy and Make (Indian) and Make (Indian) categories as well as refinements in offset policy guidelines and introduction of a new chapter on ship-building.

"There are huge opportunities for collaboration and creation of joint ventures in the defence electronics sector in India. However, the window of opportunity linked with it must benefit from big-ticket acquisitions and offset opportunities. Major companies in the global aviation industry are keenly watching the local market in India and scouting for design partners for aerospace and defence (A&D) products as India is fast emerging as a centre for engineering and design services," explains Rao.

He adds, "The time is right for catapulting India into the league of technologically-advanced nations and I invite you all to respond to the call and move along with us on this cause of Make in India."

Current industry scenario

The industry is dominated by defence PSUs and ordnance factories, which contribute about 90 per cent of the total domestic manufacturing. Combined, the DPSUs and ordnance factories have played a critical role in building a domestic industrial base in this sector as they typically outsource 20 per cent to 25 per cent of their production requirements to private companies.

In addition to public undertakings, there is a small but growing number of medium and large private companies that have already entered or are seriously evaluating opportunities to enter the market. These are in addition to 6000 MSMEs that work closely with DPSUs and the private sector.

SE, especially in defence domain, is a sensitive area and the current dependence on imports is a cause for concern. These systems are a key contributor to delivering the necessary competitive edge in conflict situations and thus, are a very important aspect of nearly all weapon systems, platforms and equipment. As a result, it is also one of the most protected industries around the world.

The Indian defence preparedness had to pass through a tough phase for several decades due to the sanctions imposed by the West. The situation was further complicated by the lack of a strong industrial base in the country, inadequate testing and other facilities and the shortage of trained/skilled human resource. Efforts in the country were limited to DRDO and DPSUs [Hindustan Aeronautics Ltd (HAL) and Bharat Electronics Ltd (BEL)] until recently.

Observing the huge potential ahead, domestic as well as global private sector companies are making inroads into the huge SE market, thrown open due to huge modernisation and acquisition programmes and offset opportunities.

Indian companies like Tata Power SED, L&T, M&M Defence Systems and Rolta are now competing with foreign established companies with global outreach. Several Tier 2 vendors such as Alpha Design, Astra Microwave and Data Patterns have also found their way into the value chain.

Despite these commendable efforts, the country still lacks the capabilities required to develop the core electronic segment of compact systems. These systems such as advanced radar technologies like AESA radar, C4ISR system and electronic warfare systems can tilt the scales either ways in a conflict scenario.

SE requires strong and sustained R&D and investment support to enable faster growth in this segment and to encourage domestic players to acquire, adopt or create new technologies.

Unless a vibrant domestic sector is created—one that includes MSMEs—procurements by the Indian government will only help create and maintain jobs in other countries. To be self-reliant and also be able to export, India will have to utilise the opportunity to make in India, to not only defend herself but also earn valuable foreign exchange.

Visit us @ Renewable Energy Expo
India Expo centre, Greater Noida
23rd – 25th Sep 2015

Smart Grid Semiconductor Solutions

Adding more than intelligence to the grid

www.infineon.com/smartgrid

NEW PRODUCTS

COMPONENTS

Insulated-gate bipolar transistor

The new M-series 650V insulated-gate bipolar transistors from STMicroelectronics offer designers a fast and affordable way to increase the efficiency of HVAC motor drives, uninterruptible power supplies, solar power converters and all power-conversion applications working up to 20kHz in hard-switching circuit topologies.

STMicroelectronics
Website: www.st.com

MOSFETs

Infineon Technologies has launched a new family of StrongIRFET MOSFETs for DC-powered circuits including battery-powered circuits, brushed and brushless DC motor drives. The MOSFETs can bring highest energy efficiency to end-applications such as power and gardening tools, light electric vehicles, drones and e-bikes that demand a high level of energy efficiency.

Infineon Technologies India Pvt Ltd
Website: www.infineon.com

Microcontrollers

Microchip Technology has announced a new series within its PIC32MX1/2 32-bit microcontroller family that

features a large 256kB flash configuration and 16kB of RAM in small-footprint packages. The PIC32MX1/2 MCU series boasts a wide variety of rich features, including up to 50MHz/83 DMIPS performance for executing advanced control applications and mTouch capacitive touch sensing.

Additional features include an enhanced 8-bit parallel master port (PMP) for graphics or external memory, 10-bit, 1Msps, 13-channel analogue-to-digital converter, support for SPI and I2S serial communication interfaces and USB device/host/on-the-go functionality.

Microchip Technology Inc.
Website: www.microchip.com

Insulated winding wire

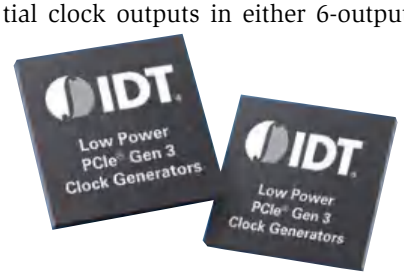
A triple-insulated winding wire with enhanced heat resistance has

been developed enabling further downsizing and performance upgrading of transformers for switching mode power supplies. It has applications in the windings of micro-transformers commonly used in personal computers, mobile phone chargers, IT equipment and other similar devices.

Sagar Switch Gears Ltd
Phone: +91-0265-2830255

Clock generators

The IDT 9FGL PCI Express (PCIe) clock generators from Mouser Electronics are low-power devices that generate low-power HCSL differential clock outputs in either 6-output



(9FGL06) or 8-output (9FGL08) forms. All 9FGL clock generators feature support for two different spread spectrum levels plus an off function (zero per cent spread).

Mouser Electronics Inc.
Website: www.mouser.com

Belt sway switch

The switch is heavy-duty with contact combination of 2NO + 2NC and contact rating of 16A/25A, resistive at 440V AC, 50Hz. Proper rubber seals have been provided to protect it against ingress of dust, and the housing is made of cast aluminium with IP65 protection.

Pyrotech Electronics Pvt Ltd
Website: www.peplelectronics.com

PCB connector

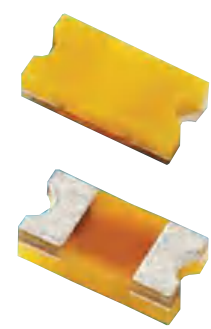
WECO, Germany, expands its product portfolio with the new 140-A-111-THR PCB connector, designed on the base of the company's standard version 140-A-111. Key features of the product are:

- 5.00mm pitch
- 2-pole to 12-pole design
- Short solder pins
- Black housing
- Lift system

Brilliant Electro-Systems Pvt Ltd
Website: www.brilliantelectronics.com

ESD suppressor

Littelfuse has introduced the XGD Series XTREME-GUARD electrostatic discharge (ESD) suppressor, available in 0402- and 0603-sized, flat-topped surface mount packages. Based on breakthrough ESD technology, it protects sensitive electronics



against ESD as high as 30kV and is suitable for high voltage applications up to 32V DC.

Littelfuse Inc.

Website: www.littelfuse.com

Server memory chipset

Rambus has introduced R+ DDR4 server memory chipset, RB26, for RDIMMs and LRDIMMs, delivering superior performance and capacity for both enterprise and data centre server markets. The first in a family of R+ chips, RB26 is an enhanced, JEDEC-compliant memory module chipset designed to accelerate data-intensive applications, including real-time analytics, virtualisation and in-memory computing, with increased speed, reliability and power-efficiency.

Rambus Inc.

Website: www.rambus.com

Diodes

Vishay Intertechnology has launched two new SurfLight high-speed infrared (IR) emitting diodes in compact 3.2mm × 1.6mm × 1.1mm surface-mount, top-view packages.

The new Vishay SurfLight IR emitting diodes are based on Vishay's GaAlAs surface emitter chip technology. The 850nm VSMY12850 and 940nm VSMY12940 semiconductors combine high radiant intensity and optical power with fast switching times.

Vishay Intertechnology Inc.

Website: www.vishay.com

TEST & MEASUREMENT

Contact resistance meter

The new contact resistance meter (model PCRM-200S) is a digital micro-ohmmeter, specially designed to measure extremely low resistances in micro-ohm. It is based on Kelvin 4-wire connection method for measurement of low resistance. Selectable test current are 100A DC and 200A DC. Test information like current injected with measured resistance and voltage drop is displayed with real-time data on an LCD screen with backlight.

The Motwane Mfg. Co. Pvt Ltd

Website: www.motwane.com

Thermal imagers

The U5856A and U5857A can perform temperature measurements up to 650°C and 1200°C, respectively. This allows users to detect a wide temperature range for various applications such as petrochemical and steel processing, electrical and mechanical applications, building maintenance and even electronics applications.

Keysight Technologies Inc.

Website: www.keysight.com

Oscilloscopes

SIGLENT Technologies announces the official release of SDS1000X series super phosphor oscilloscopes.

The new SDS1000X series based on SPO technology is available in two bandwidths, 100MHz and 200MHz, a sample rate of 1GSa/s and a standard record length of 14Mpts.

SIGLENT Technologies

Website: www.siglent.com

Logic analyser

Logic16 is a logic analyser used to record, view, and measure digital signals. It currently has 17 different protocol analysers including serial, I2C, SPI, CAN and many more. Logic16 can sample two channels at 100MHz, four channels at 50MHz, eight channels at 25MHz or all 16 channels at 12.5MHz and can record up to 10 billion samples.

Uchi Embedded Solutions

Website: www.uchiembedded.co.in

Gas detector controller

Honeywell has launched a new wall-mounted controller called Touchpoint Plus. It supports up to eight channels of gas detection for industrial and light industrial sectors, making it easier for operators to monitor the safety of their sites and staff.

Honeywell

Website: www.honeywell.com

LEDs

CoolLED driver

Harvard Engineering PLC has added ZigBee wireless control to its range of lighting power supplies. The 33W driver, called CLZ and part of the firm's CoolLED range, offers dimming down to one per cent and includes a 2.4GHz radio—either built-in or remote.

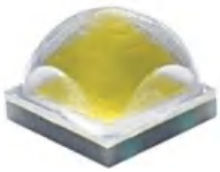
Radio communication allows the driver to tap into Harvard's EyeNut monitoring and management system for indoor lighting.

Harvard Engineering PLC

Website: www.harvardeng.com

Xlamp LEDs

Cree has unveiled the new Xlamp XHP35 family of LEDs with 50 per cent more light output than



the company's previous highest-performing single-die LED. The new devices set a new performance standard for the 3.5mm footprint.

The XHP35 LED is built on Cree's SC5 technology platform and comes with Cree's high-voltage power die architecture. It delivers up to 1833 lumens, without the optical inefficiencies of a multi-die LED, to enable new designs with reduced size and lower system costs.

Cree Inc.

Website: www.cree.com

LED light set

Larson Electronics has introduced a temporary tunnel string light set. The WAL-SL-51-LED-12.4 string light set consists of 51 industrial-grade LED lamps with 3.0m of 12/4 SJTW cable between each unit, stretching to 155.44m in length.

Each globe light is equipped with a high-output LED bulb, which delivers more light output than a 100-watt incandescent bulb.

Larson Electronics

Website: www.larsonelectronics.com

SOFTWARE

Cloud based trace judgment solution

Anritsu has launched a cloud based trace judgment solution for tower and in-building distributed antenna systems installations that reduces costs and improves ROI. Serving as a data warehouse for contractors who are installing or modifying equipment for network operators, SkyBridge Tools saves time, reduces rework and makes timely payment more likely by automating the trace judgment process.

Anritsu India Pvt Ltd

Website: www.anritsu.com

Embedded software development toolset

Altium has announced a free embedded software development toolset for industry-leading semiconductor manufacturer Infineon's TriCore/AURIX product line as part of their strategic partnership. This toolset was developed as part of a major update to TASKING compiler for TriCore/AURIX, which adds a number of new features and enhancements for advanced automotive application development.

Altium Ltd

Website: www.altium.com

Operating system

Key features of Freedom, the Android based operating system from SWIPE, are:

Customisable. Users get complete freedom in customising the user interface of their devices

Themes. Supports full-blown theme engine with hundreds of themes to select from

Swipe Search. A localised custom search engine

Swipe Gestures. Supports both off-screen gestures as well as the home-screen gestures

Swipe Box. Allows users to get 100GB storage space by aggregating all cloud storage accounts into one

Swipe Technologies

Website: www.justswipe.com

POWER SUPPLY

Solar charge controller

Systellar Innovations launched CC-HLS-12-8 model, a microprocessor based 12V-8A zero-drop solar charge controller especially designed for home lighting applications. It has been developed with special emphasis on reliability and long battery life.

Built-in protections include reverse polarity protection (battery and PV), short-circuit protection, MOV for lightening protection, overload protection and battery deep discharge protection. A 3-stage battery charging algorithm ensures proper battery backup and protects battery from overcharging.

Systellar Innovations

Website: www.systellar.co.in

MISCELLANEOUS

R-Car based development kit

Renesas Electronics has introduced the smallest R-Car based development kit till date, the ADAS Starter Kit, based on Renesas' high-end R-Car H2 system on chip. It promises to simplify and speed up the development of advanced driver assistance systems (ADAS) applications.

Renesas Electronics Corp.

Website: www.renesas.com

Camera

Transcend Information Inc. has announced the launch of its DrivePro Body 10 camera with IR LEDs. The new product is ideal for police officers and security guards.

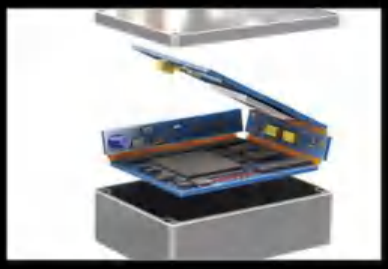
The new camera features a F/2.8 aperture, a wide 160° viewing angle, a built-in battery, a handy snapshot button and infrared LEDs for clear night vision. The product is also shock and water resistant, enabling the capture of crucial images. In addition, as the infrared LEDs are automatically turned on in low light conditions, recording at night is easier than before.

Transcend Information Inc.

Website: in.transcend-info.com

ALTIUM DESIGNER

Innovators need systems that help them make the most of new technologies, successfully manage projects, and deliver products on-time and on-budget. Altium Designer has been the tool of choice for tens of thousands of professional PCB designers across the globe.



Native 3D PCB Capabilities

Unified design and native 3D PCB capabilities to help you create the next great electronic product.

MCAD Co-Extension

Intelligently link design data between your electrical and mechanical design teams.

Rigid Flex Technology

A versatile solution to ensure that the electronics side of things work even with strict mechanical constraints.

WHY US

At GSAS we're only successful when you're successful. Our highest honor is when you release a design in less time and lower cost than before, and you get praised for excellent work. Our strong Industrial and local presence has constantly been enabling us to build a customer base of satisfied customers.

Reach out to us using the contact details below and let us help you **experience the tool** at your convenience. We also offer **training programmes** to help you get started and make the most of Altium's EDA offerings.

GSAS MICRO SYSTEMS

We are an authorised Value Added Reseller for Altium in India

Altium

GSAS Micro Systems Private Limited

www.gsasmspl.com | eda@gsasmspl.com

Corporate Office
106, 6th Main Road, 2nd Stage, Mahalakshmipuram, Bangalore - 560086

Regional Support Offices
Hyderabad | Mumbai | Pune | Visakhapatnam | Singapore

Bangalore: +919845080685 | **Hyderabad:** +919000846051 | **Mumbai / Pune:** +919819026338 | **Visakhapatnam:** +919704414410

Altium Europe GmbH

Country Manager
Mr. Sreekanth Tammana
+919591591919
sreekanth.tammana@altium.com

Bed-Vacancy Alarm System

T.K. HAREENDRAN

This inexpensive, compact bed-vacancy alarm system raises an audible alarm whenever a patient or a small kid sleeping on the bed leaves the bed.

The circuit comprises a bed sensor, an alarm box and a power supply with an optional battery-backup facility. The bed sensor can be placed under the hip of the care receiver on the mattress. The alarm box can be hooked onto a headboard/nightstand.

The highly-sensitive sensor used is nothing but a force sensing resistor (FSR). The FSR is a polymer thick-film (PTF) device whose resistance decreases with an increase in the force applied to its active surface. It is not a strain gauge, load cell or pressure transducer.

While FSR can be used for dynamic measurement, only qualitative results are generally obtainable. Usually an FSR can sense applied force anywhere in the range of 100gm to 10kg; when no pressure is applied, its resistance is larger than 100kΩ.

PARTS LIST

Semiconductors:
IC1 - ATmega328 MCU with Arduino UNO bootloader
IC2 - LM1117-5 LDO linear regulator
D1, D2 - 1N5819 Schottky barrier rectifier
LED1, LED2 - 5mm LED
T1 - BC547 npn general-purpose transistor

Resistors (all 1/4-watt, ±5% carbon):
R1, R2 - 10-kilo-ohm
R3-R5 - 1-kilo-ohm
VR1 - 100-kilo-ohm preset

Capacitors:
C1 - 47µF, 25V electrolytic
C2 - 47µF, 16V electrolytic
C3, C6 - 100nF ceramic disk
C4, C5 - 22pF ceramic disk

Miscellaneous:
$X_{TAL}1$ - 16MHz crystal
S1 - SPDT switch
S2 - Tactile switch
BAT - 9V Battery
FSR1 - FSR interface
PZ1 - Piezo buzzer interface
J1 - Connector for (9V-12V) DC supply
J2 - Connector for FTDI basic board interface

At the heart of the alarm box is 28-pin DIP AVR microcontroller (MCU) ATmega328P-PU (IC1). It can be programmed with embedded software using a standard programmer. ATmega328P-PU offers 23 input/output functional ports; a 16MHz crystal oscillator is used to provide timing/clock reference.

The power supply converts the DC from an AC mains adaptor (9V-12V/1A) into a stable DC of 5V. The regulated voltage supplied by linear voltage regulator LM1117-5.0 (IC2) is used to power the circuit.

IC2 is a low-dropout voltage regulator with a dropout of 1.2V at 800mA of load current. Available in packages like TO-220 and SOT-223, it offers current-limiting and thermal shutdown. The optional battery-backup can be from a 9V (PP3/6F22) battery pack.

FSR integration

Usually size and shape are the limiting factors in an FSR (Fig. 1) integration. Response of FSR is sensitive to the distribution of the applied force. It is therefore necessary to provide equal force distribution, using a firm, flat and smooth mounting surface.

Fig. 1: A force sensing resistor

An FSR typically has an air vent that runs from the open active area down the length of the tail and out to the atmosphere. This vent assures pressure equilibrium with the environment, and allows loading and unloading of the device. Blocking this vent could cause the FSR to respond eratically. Entire surface of the sensor should be covered using thin, uniform double-sided laminating adhesive.

Never try to solder directly to naked silver traces. A suitable zero insertion force (ZIF) style connector is recommended for interconnection.

TABLE I
Test Points

Test point	Details
TP0	GND
TP1	5V
TP2	5V in working condition
TP3	FSR output voltage

Circuit and working

After wiring the circuit as per Fig. 2, place the bed sensor (FSR) under the mattress and switch on using S1.

Set VR1 to its mid-travel (50k) and measure DC voltage at TP3 using a digital multimeter. Note down DC voltage readings when the bed is vacant or occupied. Based on this, you can add your own bed-occupancy and bed-vacancy threshold values in the software, with the help of the following relationship:

TH = [1023/5] × V

where TH is the threshold value and V is the DC voltage at TP3.

For example, if the DC voltage at TP3 is 4, when the bed is occupied, bed-occupancy threshold will be [1023/5] × 4 = 818.

Next, keep the system in power-off mode and upload the finished code to the MCU using an Arduino UNO board. The driving transistor (T1) selection depends on the piezo speaker used.

Construction and testing

An actual-size, single-side PCB for the bed-vacancy alarm system is shown in Fig. 3 and its component layout in Fig. 4. Assemble the circuit on PCB to save time and minimise assembly errors.

Use a proper IC base for the MCU. The prototype was tested using a 1.27cm (0.5-inch) dia FSR bought from *www.rhydolabz.com*. The FSR can safely handle a maximum applied force of about 10kg only. So if you want to make bed-vacancy alarm system for

AUTOMATIONUNSTOPPABLE

Technology & innovation are evolving dynamically as ever before, BB's next generation & ever reliable range of VRLA & Gel batteries are the most preferred by the stringent world technology leaders. Now be assured no matter whatever the application be, your concentration will only have to be on your job and the responsibility of keeping everything powered automatically rests on us.

- STANDBY APPLICATION
- CYCLIC APPLICATION
- TELECOM APPLICATION
- SOLAR APPLICATION

INDIA & SAARC: B&B BATTERY (INDIA) Co. Private Ltd.

 # 88, 3rd Main, Dollars Colony, 4th Phase, J P Nagar, Bangalore – 560078. INDIA
T: +91 80 2649 6670, 2649 6680 • W: bb-battery.com • E: indiadmin@bb-battery.com

Start a Change

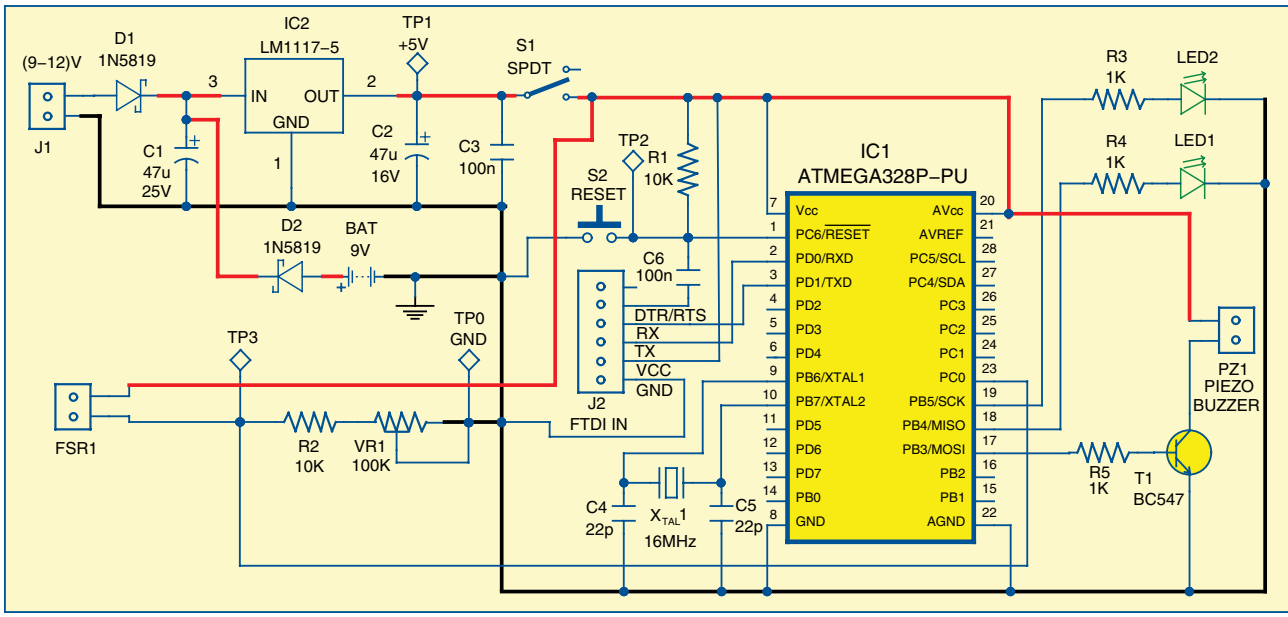


Fig. 2: Circuit diagram of the bed-vacancy alarm system

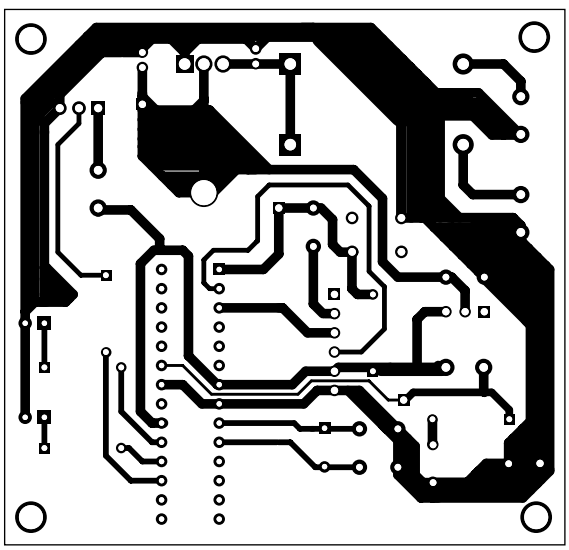


Fig. 3: Actual-size PCB pattern of the bed-vacancy alarm system

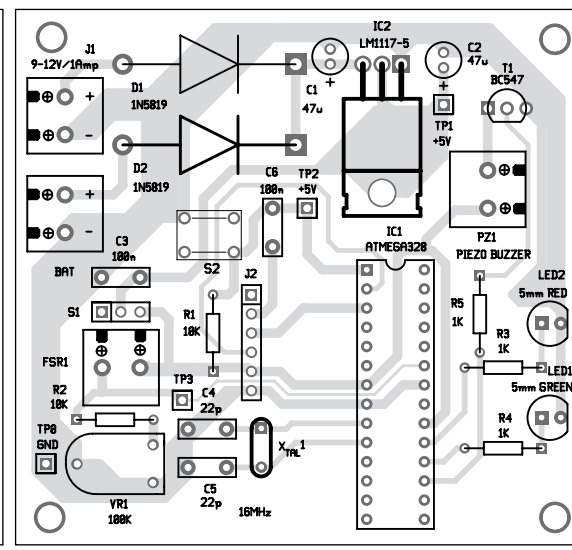


Fig. 4: Component layout of the PCB

larger beds, deploy several FSR sensors, so that the bed is assumed to be empty when none of the sensor values are above the threshold limit.

TABLE II
Technical Documentation of FTDI Basic Board

FTDI basic board	Serial interface socket J2
DTR	DTR/RTS
RXI	RX
TXO	TX
5V	5V
CTS	N/C
GND	GND

Software program

The software has the following functions:

```
void setup(void)
```

This function is used to initialise control pins as digital output.

```
void loop(void)
```

This function is used to read FSR output and generate an alarm, depending on the threshold value.

In case a USB interface is absent in the system board, it becomes necessary to use a home-made/ready-made USB-to-serial converter for programming the MCU. Inexpensive and easy-to-use USB-to-serial converters (FTDI basic boards) are now widely-available. Usually, one USB interface connection and six output connections (DTR, RXI, TXO, 5V, CTS and GND) are available in FTDI basic. Connect the circuit as shown in Table II (not tested in EFY Lab). ●

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*

T.K. Hareendran is an electronics hobbyist, freelance technical writer and circuit designer

APLAB introduces Advanced Version of Ultra-compact Digitally

Programmable High Power DC Power Sources

APLAB offers Ultra Compact, High Efficiency Programmable DC Sources with an advanced version that gives higher power, regulation as well as efficiency and more programming options. The new series is designed aiming for increasing market share in Europe and USA besides Far East and India.

HI-POWER PROGRAMMABLE DC POWER SUPPLIES - PHP Series
800W to 7500W DC Output

Seven Models with Programmable Voltage Range : 0 to 10V to 0 to 120V
Maximum Power per 1U high module : 1400W
Master Slave

Features

- High Power Density: 1400W in a 1U High Euro Rack unit.
- Soft Switching for low losses and low Ripple and Noise
- Industrial Digital Encoder for Voltage and Current Setting
- µP based system for data Logging and ultra-stable voltage reference
- Active Input PFC with universal Line Input: 95V to 270V AC/ 50-60Hz
- Parallel Operation up to 9 units with Active Current Sharing
- Isolated Analogue Programming and Monitoring Surface
- Wide Choice of Interface RS232, RS485, GPIB for External Programming
- Lab-View and Lab-Window Drivers
- Standard 19" Rack Mount Suitable for ATE and OEM Applications

Aplab
POWER SOLUTIONS

Please Contact Mr. Narayan Murthy on 9819739560

APLAB LIMITED
Aplab House, A-5, Wagle Estate, Thane 400 604. India.
Tel. : +91-22-67395555, 25821861 Fax : 25823137 Email : response@aplab.com

www.aplab.com

12V Battery Absorb and Float Charger

FAYAZ HASSAN

Most battery chargers stop charging the battery when it attains its maximum charging voltage set by the circuit. This circuit charges the battery at a particular voltage, that is, absorption voltage, and once the maximum charging voltage is attained, the charger changes the output voltage to float voltage for maintaining the battery at that voltage. Absorption and floating voltages are dependent on the type of battery.

For this charger, voltages are set for a sealed lead-acid (SLA) 12V, 7Ah battery, for which absorption voltage is 14.1V to 14.3V and floating voltage is 13.6V to 13.8V. For safe working and to avoid overcharging of battery, absorption voltage is selected as 14.1V and floating voltage is selected as 13.6V. These values are to be set as specified by the battery manufacturer.

Circuit and working

Circuit diagram of the 12V battery absorb and float charger is shown in Fig. 1. It is built around step-down transformer X1, adjustable voltage regulator LM317 (IC1), op-amp comparator LM358 (IC2) and a few other components.

The 230V AC primary to 15V-0-15V, 1A secondary transformer used in this circuit steps down mains voltage, which is rectified by diodes D1 and D2 and smoothened by capacitor C1.This voltage is given to the input of LM317 for regulation.

The basic circuit is a regulated power supply using LM317, with a control on output by changing resistance at adjust pin 1. A good heatsink is required for LM317. LM358 is a dual-operation amplifier that is used here to control overcharging of the battery. Capacitor C4 should be as near as possible to pin 1 of IC2.

Jumper J1 is used for calibration (set-up). While setting the charging voltage, remove the jumper and connect it back after calibration.

Test Points

Test point	Details
TP0	GND
TP1	Around 0.5V
TP2	13.6V-14.1V
TP3	High when battery is fully charged

PARTS LIST

Semiconductors:

IC1	- LM317 adjustable voltage regulator
IC2	- LM358 op-amp
T1	- BC547 npn transistor
LED1-LED3	- 5mm LED
ZD1	- 6.8V zener diode
D1-D5	- 1N4007 rectifier diode

Resistors (all 1/4-watt, ±5% carbon, unless stated otherwise):

R1	- 270-ohm
R2	- 2.2-kilo-ohm
R3, R6	- 10-kilo-ohm
R4, R5	- 22-kilo-ohm
R7	- 0.2-ohm, 5W
R8, R9	- 4.7-kilo-ohm
VR1	- 2-kilo-ohm potmeter
VR2	- 5-kilo-ohm potmeter
VR3	- 20-kilo-ohm potmeter

Capacitors:

C1	- 2200µF, 40V electrolytic
C2, C3	- 10µF, 25V electrolytic
C4	- 0.1µF ceramic disk

Miscellaneous:

X1	- 230V AC primary to 15V-0-15V, 1A secondary transformer
CON1, CON2	- 2-pin connector terminal
	- 12V, 7Ah rechargeable battery
J1	- 2-pin connector for jumper J1
S1, S2	- On/off switch
	- Heat sink for LM317

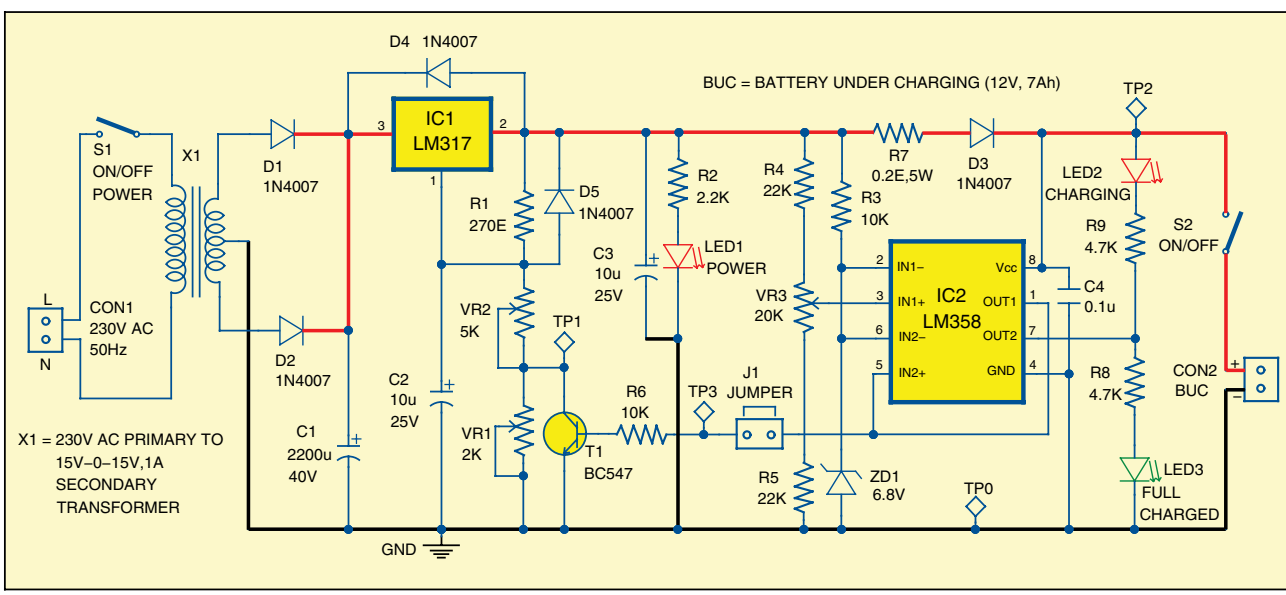


Fig. 1: Circuit diagram of the 12V battery absorb and float charger

MEASURE WITH THE BEST

COMPLETE YOUR TEST BENCH WITH FULL RANGE
OF GRATTEN T&M PRODUCTS

SPECTRUM ANALYZERS

1.5GHz / 3GHz / 7.5GHz

SIGNAL GENERATORS

3GHz / 4GHz

DIGITAL OSCILLOSCOPES

25MHz, 40MHz, 50MHz, 60MHz
70MHz, 100MHz, 110MHz,
200MHz, 300MHz

Gratten is a premier manufacturer of electronic test and measurement equipment in China. Our T&M instruments and systems are setting standards worldwide in research, development, production and service. We are the key partner of the industry and network operators for all measurement application in the field of analog and digital communications.

Other Products

Network Analyzers | Function Generators | Handheld Scopes | RF Probes | Power Supplies | RF Training Kits

Building A8, 2nd Flr, Tanglang Indl Zone, Xili, Nanshan, Shenzhen, China +86 755 86021369 gratten@gratten.cn

GRATTEN | NANJING GLARUN ATTEN TECHNOLOGY CO. LTD.

www.gratten.cn

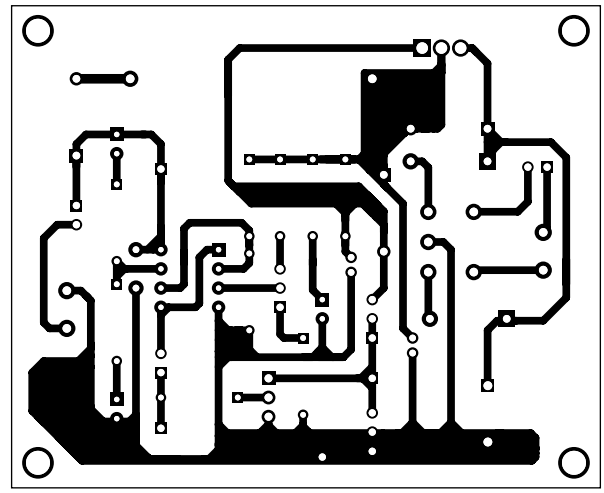


Fig. 2: Actual-size PCB of the charger

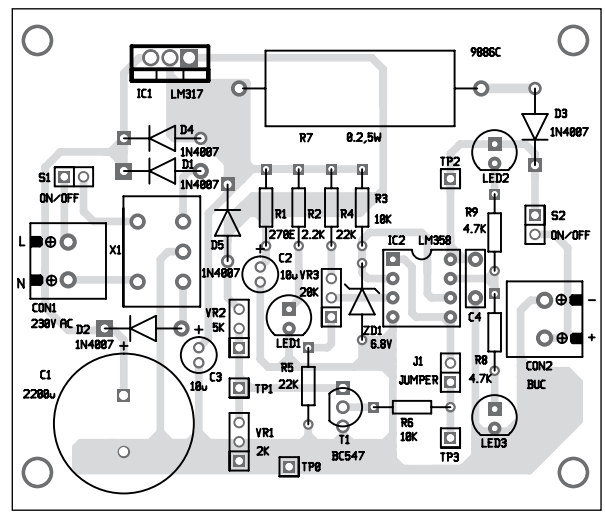


Fig. 3: Component layout of the PCB

For initial setup, remove jumper J1, switch off S2, switch on S1 and adjust potmeter VR2 to get 13.6V at test point TP2. Adjust potmeter VR3, so that LED2 begins to glow. Adjust potmeter VR1 to read 0.5V (difference of 14.1V and 13.6V) at test point TP1. Adjust VR2 to read 14.1V at test point TP2.

With these settings, TP2 should read 14.1V when there is low voltage at test point TP3, and 13.6V when there is high voltage at test point TP3. Connect jumper J1. The charger is now ready for use.

Connect the 12V battery under charging (BUC), with correct polarity, at CON2. Switch on S2; one of the LEDs out of LED2 and LED3 will light up (most likely it would be LED2). If neither of these light up, check the connections; battery could be dead. Switch on S1 for charging. Fully charged status of the battery will be indicated by glowing of LED3.

Do not worry if you forget to switch off the charger. The charger is on floating voltage (13.6V) now and it can be kept in this charging mode forever.

Construction and testing

An actual-size, single-side PCB for the 12V battery absorb and float charger circuit is shown in Fig. 2 and its component layout in Fig. 3. Assemble the circuit on the PCB, except transformer X1 and the battery under charge (BUC).

Enclose the PCB in a small box. Fix the battery terminal on the front of the box for connecting the BUC. Connect switches S1 and S2, potmeters VR1 through VR3, etc on the body of the box.

EFY notes. 1. Switch off S2 or disconnect battery terminals to avoid unnecessary discharge of battery when not charging, that is, when S1 is switched off.

2. Connect the battery with correct polarity.

3. Casing of IC1 should not be connected to ground, so use insulation. ●

Fayaz Hassan is manager at Visakhapatnam Steel Plant, Visakhapatnam, and is interested in microcontoller projects, mechatronics and robotics

Lighting LED

67-21S Series (2835 Pkg)
- 0.5W / 3V / 150mA
- Efficacy: typ. 130 lm/W
(for Tube Light, Panel Light)

- 1W / 6V / 150mA
- Efficacy: typ. 125 lm/W
(for Bulbs, Panel light)

SHWO F Series (3535)
- 1W~3W
- Efficacy: 140 lm/W
(for Street Light)

XI5050 Series (5050)
- 4W
- Efficacy: typ. 135 lm/W
(for Bulbs, Downlight)

XI9595 Series (9595)
- 8W
- Efficacy: typ. 140 lm/W
(for Bulbs, Downlight)

Automotive LED

Exterior Application 67-41 Series
3528 PLCC4 Color /

Automotive LED

Interior Application 67-21 Series
3528 PLCC2 Color /

Signage LED

5484BN

67-01 Series

Structures and materials depend on demand of client.

The Right LED for The Right Application

As a leading opto-electronics solution provider, EVERLIGHT proved its three decades of experience in optoelectronics on production expertise and manufacturing capacity. In the meantime, offering a total solution to fulfill all demands with the idea of "the Right LED for the Right Application", EVERLIGHT supports the Right LED be paired with the appropriate applications in order to provide the best performance and quality to clients.

EVERLIGHT ELECTRONICS INDIA PVT LTD
Phone: +91-80-41633111 (Bangalore) / 0120-6608019 (Delhi)
FAX: +91-80-41622111
Email : salesindia@everlight.com / anuj@everlight.com

EVERLIGHT

Programmable On and Off Controller for 3-Phase Motor

DR R.V. DHEKALE

Automatic on/off controller for a 3-phase electric motor can be made with a programmable time switch. In this case a maximum of eight time durations can be programmed.

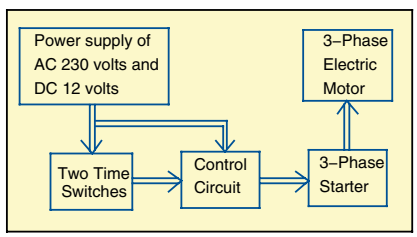


Fig. 1: Block diagram of the programmable on and off controller for a 3-phase electric motor

The system has two programmable time switches for setting the starting and stopping times of the motor and two control circuits, which are interfaced with the start and stop switches of the 3-phase motor's starter. Block diagram of the system is shown in Fig. 1.

Suppose, same clock times are set in both the time switches. So, if start time of, say, 8am is programmed for timer1 ON mode, then 8.01am will be programmed for timer1 OFF mode in start time switch. And, if stop time of, say, 9am is programmed for timer2 ON mode, then 9.01am will be programmed for timer2 OFF mode in stop time switch.

When time reaches 8am, the start time switch connects the primary of transformer X1 to 230V AC. Output of the power supply gets connected to reset pin 4 of IC1. R4 and C3 act as self triggering components.

Test Points

Test point	Details
TP0	GND
TP1	+12V
TP2	+12V

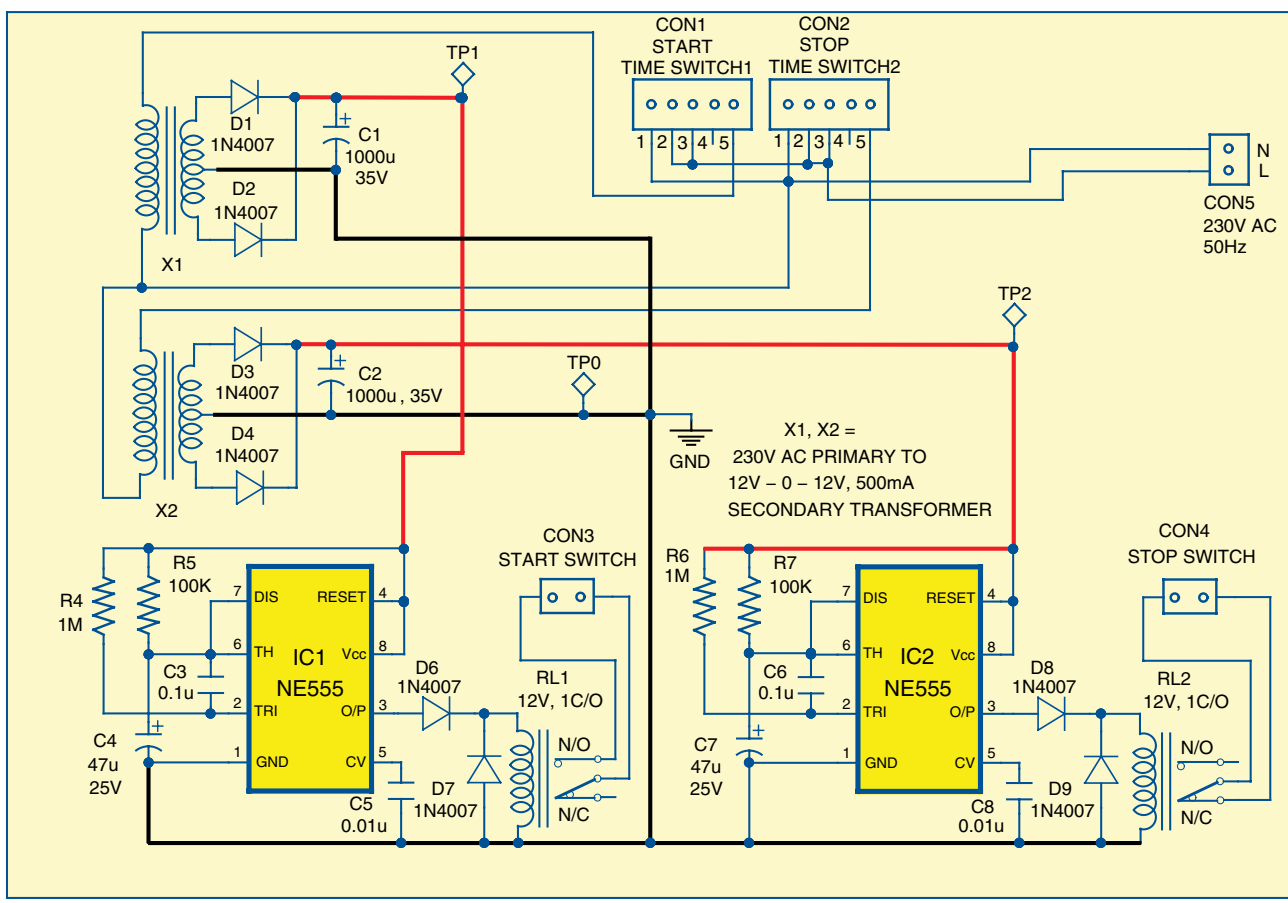


Fig. 2: Circuit diagram of the programmable on and off controller for a 3-phase electric motor

PARTS LIST

Semiconductors:
IC1, IC2 - NE555 timer
D1, D2, D3, D4, D6, D7, D8, D9 - 1N4007 rectifier diode
Resistors (all 1/4-watt, ±5% carbon):
R4, R6 - 1-mega-ohm
R5, R7 - 100-kilo-ohm
Capacitors:
C1, C2 - 1000µF, 35V electrolytic
C3, C6 - 0.1µF ceramic disk
C4, C7 - 47µF, 25V electrolytic
C5, C8 - 0.01µF ceramic disk
Miscellaneous:
RL1, RL2 - 12V, 1C/O relay
X1, X2 - 230V AC primary to 12V-0-12V/500mA secondary
CON1, CON2 - 5-pin connector interface for time switch
CON3, CON4 - 2-pin connector interface for starter switches
CON5 - 2-pin connector interface for AC input

Output of the monostable at pin 3 becomes high for a period equal to 1.1 × R5 × C4, which is nearly equal to five seconds.

As pin 3 of IC1 is high, relay RL1 gets energised for five seconds, which, in turn, shorts the start switch, extending the 3-phase supply to the motor. This is virtually similar to physically pressing the start switch of the 3-phase motor starter for five seconds.

When time reaches 9am, the second time switch (stop switch) provides 230V AC to the primary of transformer X2. Again, by using a full-wave rectifier and filter circuit, 12V DC is provided to the second monostable circuit having relay RL2.

Normally-closed (N/C) terminal of the relay is connected in series with the stop switch of the starter of the 3-phase motor. So, the relay breaks the circuit to stop the motor.

This is an example of one time duration of 8am to 9am. In this way, a maximum of eight time durations can be programmed to switch the 3-phase electric motor on and off.

Fig. 3: Front of the time switch


Fig. 4: Rear of the time switch

There is provision for setting days of the week for the controller to function. For instance, it can be set to work from Monday to Friday, Monday to Saturday, all seven days of the week, or only on a particular day of the week.

This system can find many applications, including switching on a water pump in a multi-storeyed commercial building to fill overhead tanks only for five or six days in a week. It can also prove useful for farmers, industrial units or railway stations where 3-phase motors are used.

Circuit and working

Two identical power supply circuits are built around transformers X1 and X2 with associated components as shown in Fig. 2. The arrangement provides 12V DC to two control circuits built around two 555 timers IC1 and IC2, which are configured in monostable mode.

The two time switches used in this system are Frontier-made, model TM-619-2. These operate on 230V AC at 50Hz. Each switch has a built-in single changeover relay with contact rating of 16A. It has an LCD display with buttons such as CLOCK, TIMER, DAY, HOUR, MIN and MANUAL, as shown in Fig. 3. By using these buttons, a real-time clock is set and various time durations are programmed.

The time switch is a programmable digital device that has a digital real-time clock and can program for a maximum eight time durations. The time durations can be for a particular day, alternate days, Monday to Friday, Monday to Saturday, or Monday to Sunday.

By holding CLOCK button, real time is set by using HOUR, MIN and DAY buttons, while various time durations are programmed by using TIMER, HOUR, MIN and DAY buttons.

There are three modes, namely, ON, AUTO and OFF, written just below the display. After programming time durations, a black horizontal line segment is kept over AUTO mode from OFF mode by pressing MANUAL button. The time switch provides five external pins numbered 1 to 5 as shown in Fig. 4.

230V AC is applied across pins 1 and 2 of connectors CON1 and CON2 for start and stop switches, with

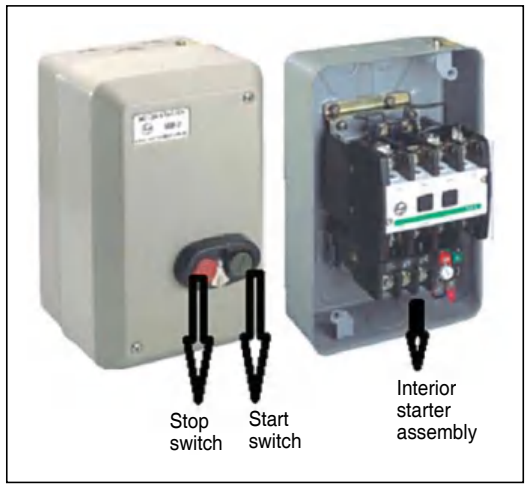


Fig. 5: A typical starter for a 3-phase motor

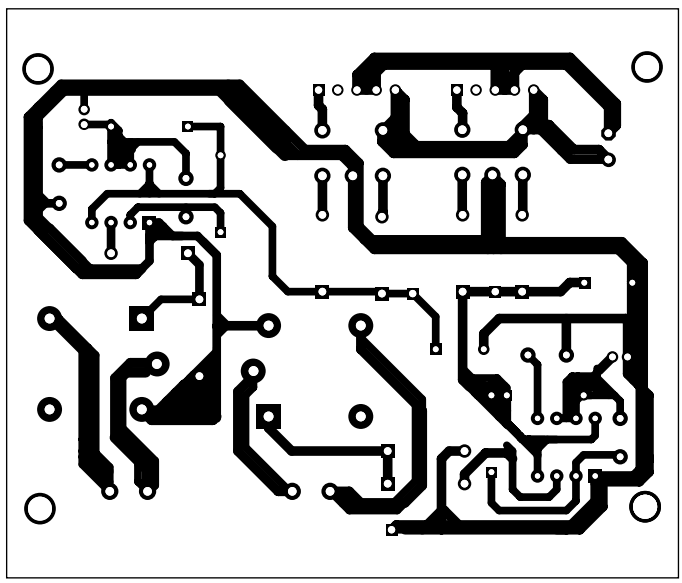


Fig. 6: Actual-size PCB of the 3-phase electric motor controller

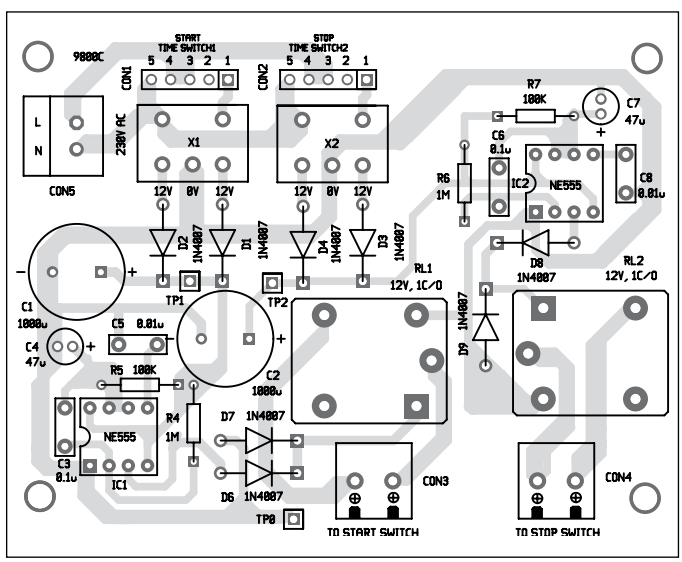


Fig. 7: Component layout of the PCB

pin 1 being neutral. Live pins 2 are joined by wire to pins 3 and output voltage is taken from pins 1 and 5. There is a provision of button cell CR2032 to hold the clock and programmed times. That means, even if 230V AC is turned off, the clock and programmed times are not disturbed (during mains failure) for 60 to 90 days. When mains power is present, the cell is charged continuously.

The control circuit has two monostable multivibrators for the time delay of five seconds. The start time switch1 is connected to the first monostable multivibrator built around IC1 as shown in Fig. 2.

The real-time clock of time switch1 is set by pressing and holding CLOCK button and adjusting the time by using HOUR, MIN and DAY buttons. If first time duration of 8am to 9am has to be programmed at weekly mode, then 8am is programmed at 1 ON mode and 8.01am is programmed at 1 OFF mode in the first time switch by selecting weekly mode.

The motor is switched off by using the second multivibrator circuit as shown in Fig. 2, in which N/C and common terminals of relay RL2 are connected in series with off switch of the starter.

Real-time clock is set by pressing and holding CLOCK button and adjusting the time by using HOUR, MIN and DAY buttons. Off time, that is, 9am, is programmed at 1 ON mode with weekly day selection by pressing the TIMER button.

Again, by pressing TIMER button, 9.01am is set at 1 OFF mode with weekly day selection in the second time switch. When time 9am is reached, the second time switch provides 230V AC across the primary of step-down transformer X2, and the second full-wave rectifier outputs 12V DC. This voltage goes to the second monostable multivibrator circuit as shown in Fig. 2.

Fig. 5 shows the photograph of a typical starter for a 3-phase electric motor along with the interior assembly of the starter. On the right of the photograph, two push-buttons are shown; the green push-button is used to start the motor and the red push-button is used to stop it. It also has a relay coil. When start switch is pressed momentarily, current flows through the coil, relay strip is pulled towards the iron of the coil and 3-phase voltage gets applied to the motor.

Construction and testing

An actual-size, single-side PCB of the 3-phase electric motor is shown in Fig. 6 and its component layout in Fig. 7.

EFY note. Reset the time switch if there is any difficulty in setting time on the time switch. ●

Dr R.V. Dhekale is currently working as associate professor and head of department (Physics) at Kisan Veer Mahavidhyalaya, Maharashtra. He is a life member of Indian Association of Physics Teachers

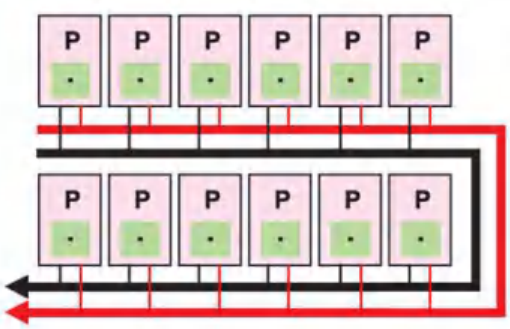
Buying a Roof-top PV Solar System?

SAVE YOUR MONEY!!!

MITRAMAX ENERGY SAVES 20% OF YOUR CAPITAL COST IN BUYING A PV SOLAR PLANT!

MITRAMAX ENERGY has Australian Innovation Patent
For LEECH PV SOLAR MODULES
THAT HARVEST 20% MORE SOLAR ENERGY

For example,
Buying MITRAMAX 8kWp PV Solar Plant will give same energy output as from a conventional 10kWp PV Solar Plant!!



UNIQUE FEATURES of LEECH PV TECHNOLOGY

- Extracts maximum solar energy 'like a Leech' from a PV Module
- Patented ruggedized Controller; integrated MPPT + DC Boost
- LEECH PV Modules harvest 15 to 20% more solar energy
- Daisy Chain of LEECH saves time & junction boxes
- Can connect Hundreds of LEECH modules for higher energy
- No matching of modules is essential like in a series strings array
- Avoids huge energy loss caused by shadow in series strings used
- Avoids conduction losses due to currents with fewer junction boxes
- Environmentally designed to work at temp from -40°C to +80°C

MITRAMAX™
www.mitramax.com

Mitramax Energy Pvt. Ltd.
Deodhar Centre, 424, Marol Maroshi Road, Andheri (E), Mumbai 400 059. INDIA
T: +91 22 28290059 / 29290055 F: +91 22 28290470 E: info@mitramax.com

Generating a Fixed-Frequency Sinusoidal Signal from Digital Output

PETRE TZV PETROV

For some testing purposes we may need a fixed-frequency sinusoidal signal of 440Hz, 1kHz, etc. But most low-cost microcontrollers (MCUs) do not have internal digital-to-analogue converters (DACs). Adding external DACs could be expensive and/or complicated, and these are not always needed. Fortunately, most MCUs can easily produce fixed-frequency square-wave signals with frequencies required for the sinusoidal signals.

Circuit and working

The circuit can be configured in two ways; one that produces a sinusoidal signal with RC filters and another that produces a sinusoidal signal with a combination of RC and LC filters.

Fig. 1 shows the circuit for producing a sinusoidal-like signal with RC filters. Output pin 33 (RB0) of PIC16F877A (IC1) produces a square-wave signal, for example, with a frequency of 1kHz. This signal is filtered using three RC filters built correspondingly with R2 and C4, R3 and C5, and R4 and C6. The cut-off frequency of these filters is practically equal to the frequency of the square-wave signal produced on pin 33 (RB0). This is also the frequency of the produced sinusoidal signal.

This frequency is calculated using the relationship:

$F(-3dB) = 1/(2 \times \pi \times R \times C) = 1/(6.28 \times R \times C)$ [Hz]

where R is R2, R3 or R4, and C is C4, C5 or C6.

Also, for good filtration of harmonics, the following equation is suggested:

$R4 = 10 \times R3 = 100 \times R2$

For a frequency of 1kHz, the following popular values are suggested:

R2 = 1k-ohm, R3 = 10k-ohm and R4 = 100k-ohm

C4 = 150nF, C5 = 15nF and C6 = 1.5nF

The filtered signal at point A is amplified by operational amplifier TL071 (IC2) and is available on connector CON2. Gain of the output stage = 1 + R7/R6 = 10, and is selected according to the requirement.

Fig. 2 shows the circuit for pro-

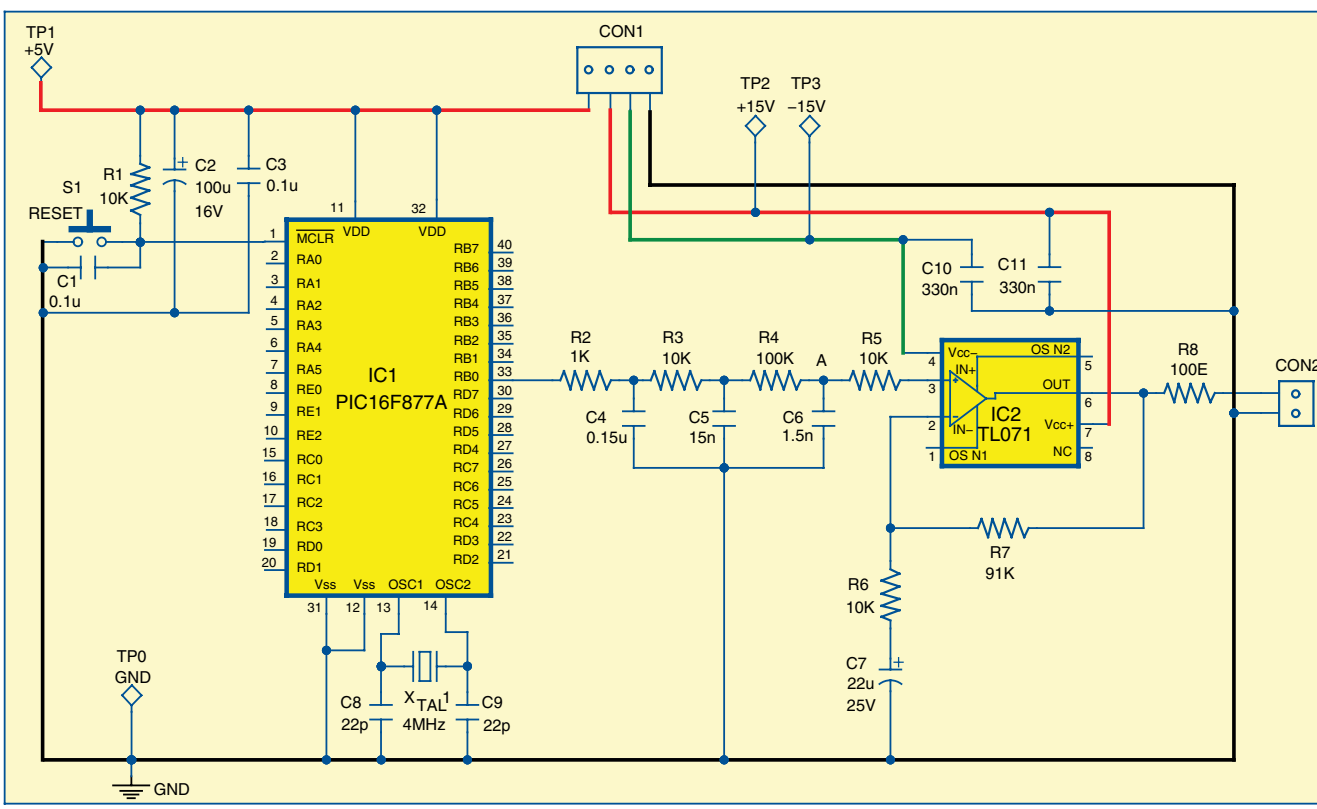


Fig. 1: Circuit diagram for producing a sinusoidal signal with RC filters

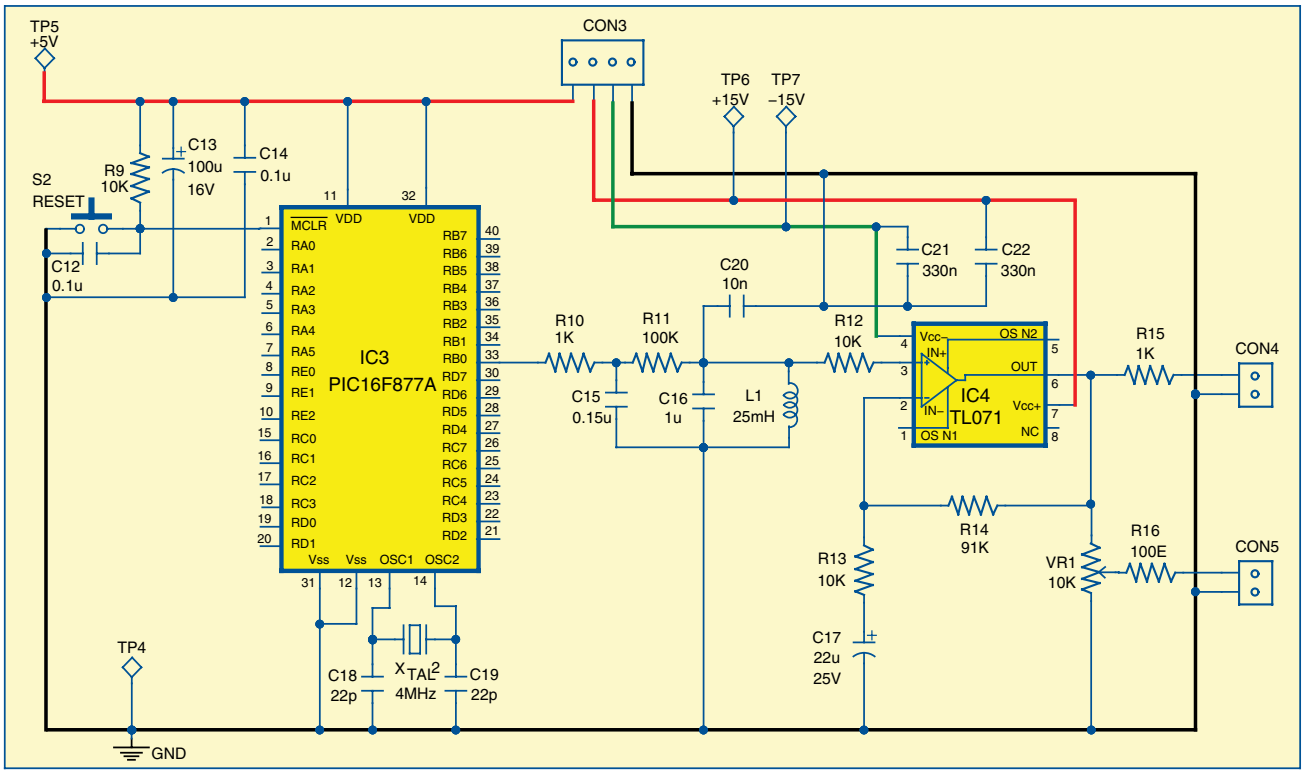


Fig. 2: Circuit diagram for producing a sinusoidal signal with a combination of RC and LC filters

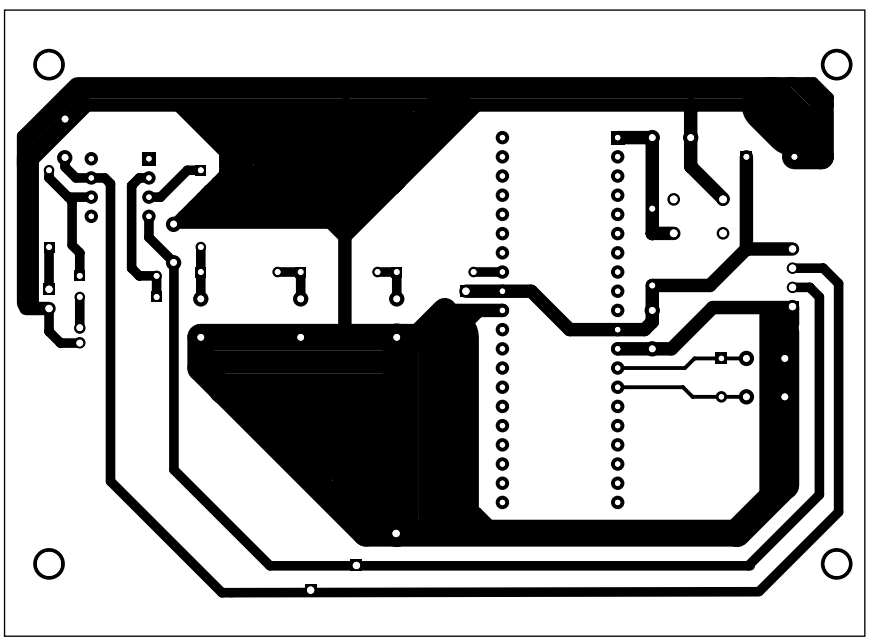


Fig. 3: Actual-size PCB pattern of the circuit for a sinusoidal signal with RC filters

ducing a sinusoidal signal using a combination of RC and LC filters for better quality of filtration.

The RC filter is built with R10 and C15. Its cut-off frequency is equal to:

$F(-3dB) = 1/(2 \times \pi \times R10 \times C15) = 1/(6.28 \times R10 \times C15)$ [Hz]

The LC filter is built with L1 and C16. Its resonant frequency is equal to:

$Fr = 1/(2 \times \pi(\text{sqrt}(L1 \times C16))$[Hz]

Ideally, $F(-3dB) = Fr$, but in practice, an accuracy of ±5% or even ±10% is acceptable.

PARTS LIST

Semiconductors:

IC1, IC3	- PIC16F877A 8-bit MCU
IC2, IC4	- TL071 low-noise JFET-input operational amplifier

Resistors (all 1/4-watt, ±5% carbon):

R1, R3, R5, R6, R9, R12, R13	- 10-kilo-ohm
R2, R10, R15	- 1-kilo-ohm
R4, R11	- 100-kilo-ohm
R7, R14	- 91-kilo-ohm
R8, R16	- 100-ohm
VR1	- 10-kilo-ohm potmeter

Capacitors:

C1, C3, C12, C14	- 0.1µF ceramic disk
C2, C13	- 100µF, 16V electrolytic
C4, C15	- 0.15µF ceramic disk
C5	- 15nF ceramic disk
C6	- 1.5nF ceramic disk
C7, C17	- 22µF, 25V electrolytic
C8, C9, C18, C19	- 22pF ceramic disk
C16	- 1µF, 25V MLCC
C20	- 10nF ceramic disk
C10, C11, C21, C22	- 330nF ceramic disk

Miscellaneous:

CON1, CON3	- 4-pin connector
CON2, CON4, CON5	- 2-pin connector
L1	- 25mH inductor
S1, S2	- Tactile switch
$X_{TAL}1$, $X_{TAL}2$	- 4MHz crystal

Values of the components are given for producing a sinusoidal signal of 1kHz. Capacitor C20 can be added

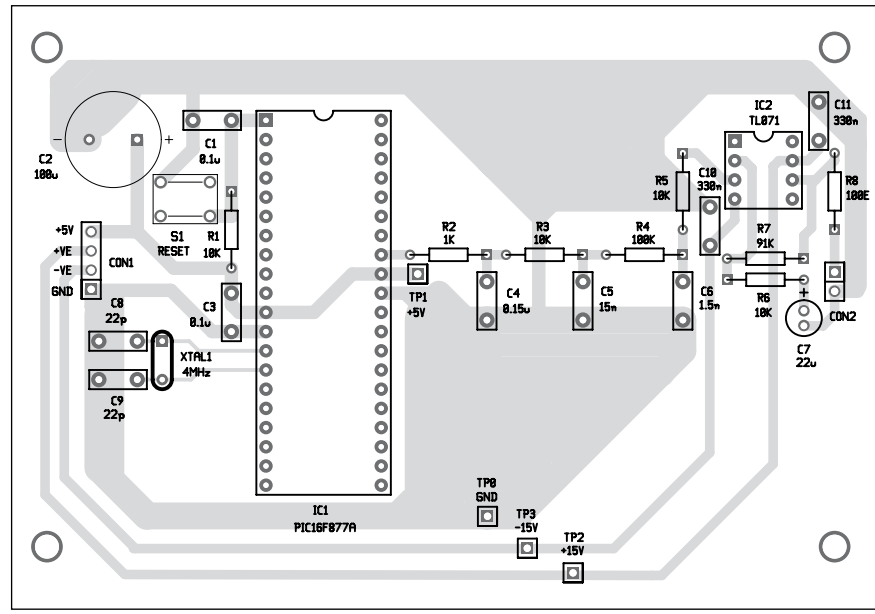


Fig. 4: Component layout of the PCB shown in Fig. 3

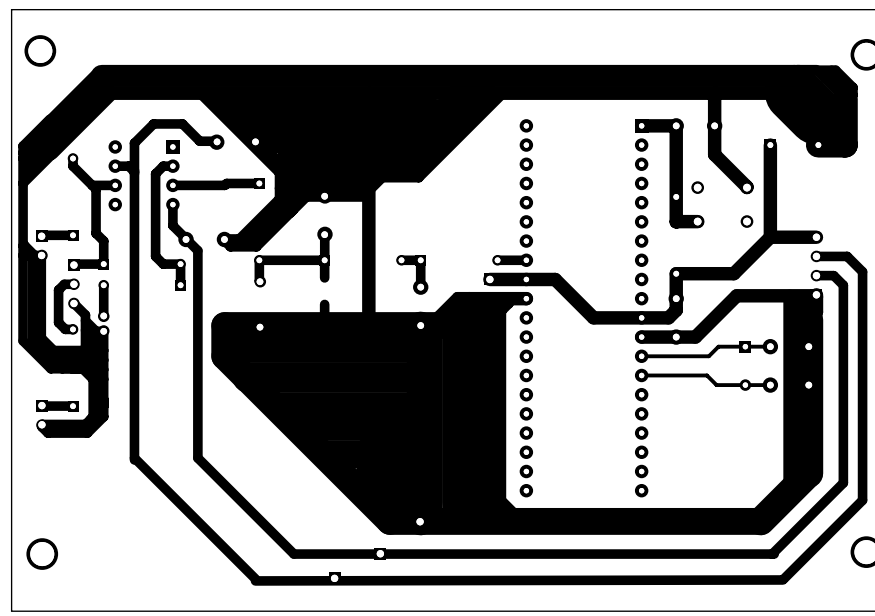


Fig. 5: Actual-size PCB pattern of the circuit for a sinusoidal signal with RC and LC filters

Test Points

Test point	Details
TP0, TP4	0V (GND)
TP1, TP5	+5.0V
TP2, TP6	+15V
TP3, TP7	-15V

to lower the resonant frequency, though it is rarely needed.

Output signal is amplified using operational amplifier IC4. The output at CON5 can be adjusted with VR1. The circuits are applicable in the entire audible range of 20Hz to 20kHz.

Construction and testing

An actual-size, single-side PCB for the circuit in Fig. 1 is shown in Fig. 3 and its component layout in Fig. 4. Similarly, an actual-size, single-side PCB pattern for the circuit in Fig. 2 is shown in Fig. 5 and its component layout in Fig. 6. Ensure proper values

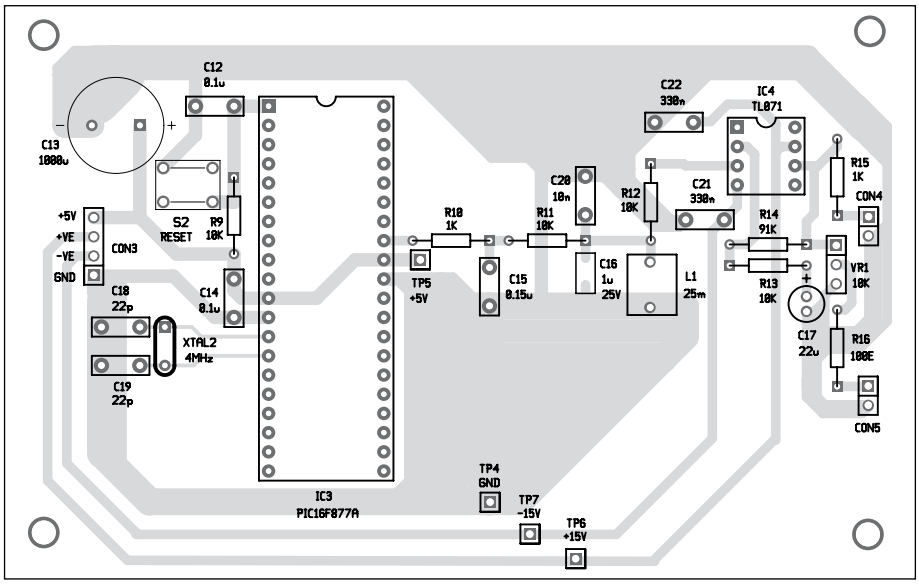


Fig. 6: Component layout of the PCB shown in Fig. 5

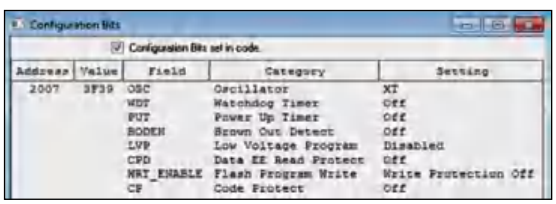


Fig. 7: Configuration bit

of the resistors, capacitors and inductor to get proper output.

Software

The program is written in C language and compiled using HI-TECH compiler along with MPLABIDE to generate the hex code. The generated hex code is burnt into the MCU using a suitable programmer with configuration bit setting. The set configuration bit is shown in Fig. 7. The program is well-commented and easy to understand. Delay function is used to generate frequency. ●

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com* website.

Petre Tzv Petrov was a researcher and assistant professor at Technical University of Sofia (Bulgaria) and an expert-lecturer in OFPPT (Casablance), Kingdom of Morocco. Now, he is working as an electronics engineer in the private sector in Bulgaria

Thermocouple Tutorial with Arduino Interfacing

RONIE ADHIRAAJ GHOSH

Here is a simple project for interfacing a thermocouple with Arduino board. In high-temperature process-control applications, some ICs and sensors fail to operate at certain high temperature levels. So a simple, rugged and linear thermocouple can be used to prevent that.

A thermocouple is made by fusing the tips of two dissimilar metals. It works on the principle of Seebeck Effect, which states that when one end of a pair of two dissimilar metals is heated, a potential difference forms at their other end, which is directly proportional to the temperature difference of the two ends. The basic setup of a thermocouple is shown in Fig. 1.

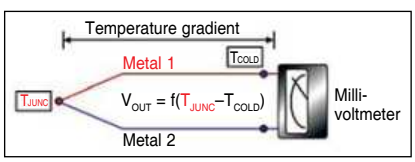


Fig. 1: Setup of a thermocouple

V_{OUT} is the function of the temperature differential (T_{JUNC}-T_{COLD}) and the types of metal in metal 1 and metal 2. However, since the thermocouple measures T_{JUNC} differentially, the absolute cold-junction temperature (in °C, °F, or °K) must be known to determine the actual temperature measured at the hot junction.

All modern thermocouple based systems use additional absolute temperature sensors (PRTD, silicon sensors and others) to accurately measure the temperature of the cold junction end and mathematically compensate for the difference.

Tabs = T_{JUNC} + T_{COLD}

where Tabs is the absolute temperature of the hot junction, T_{JUNC} is the relative temperature of the hot junction versus cold reference junction, T_{COLD} is the absolute temperature of the reference cold junction.

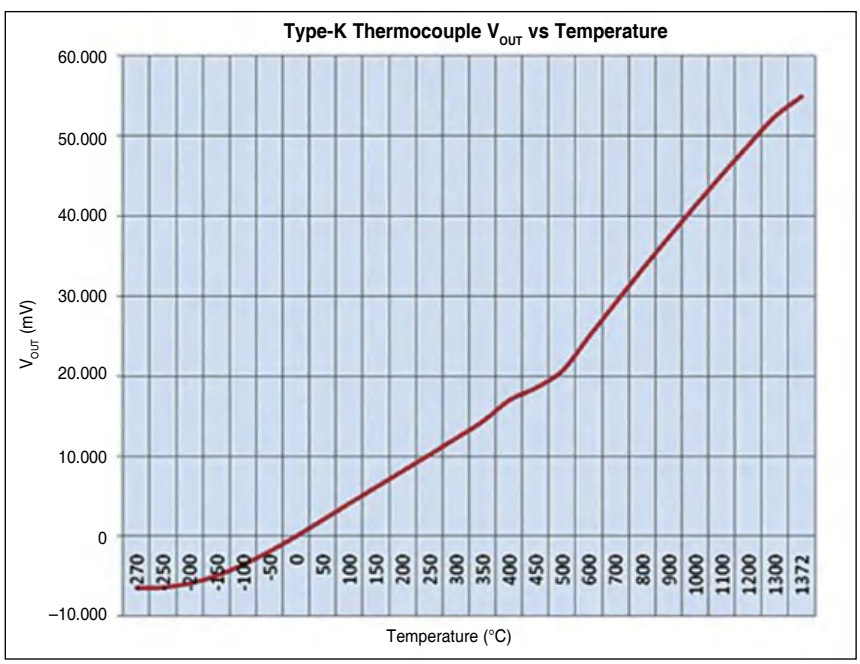


Fig. 2: Output of K type thermocouple

There are a dozen varieties of thermocouples but some specific material pairs of dissimilar metals work better in certain industrial or medical conditions. These combinations of metals and/or alloys were standardised by NIST and International Electrotechnical Commission (IEC), and are abbreviated as E, J, T, K, N, B, S, R, etc.

J type thermocouples are widely used because of their relatively high Seebeck coefficient, high precision and low cost. These thermocouples allow measurements with precision up to ±0.1°C, using a relatively simple linearisation calculation algorithm.

K type thermocouples are very popular for industrial measurements covering a wide temperature range. These thermocouples offer a modestly high Seebeck coefficient, low cost and good resistance to oxidation. These thermocouples allow measurements with precision up to ±0.1°C.

E type thermocouples are less widespread than other thermocouples. However, Seebeck coefficient is highest in this group. Measurements made by an E type thermocouple require less measurement resolution than other types. These thermocouples allow measurements with precision up to ±0.5°C and require a relatively complex linearisation calculation algorithm.

S type thermocouples are made of platinum and rhodium, a combination that allows more stable and reproducible measurements at very high temperatures in oxidising atmos-

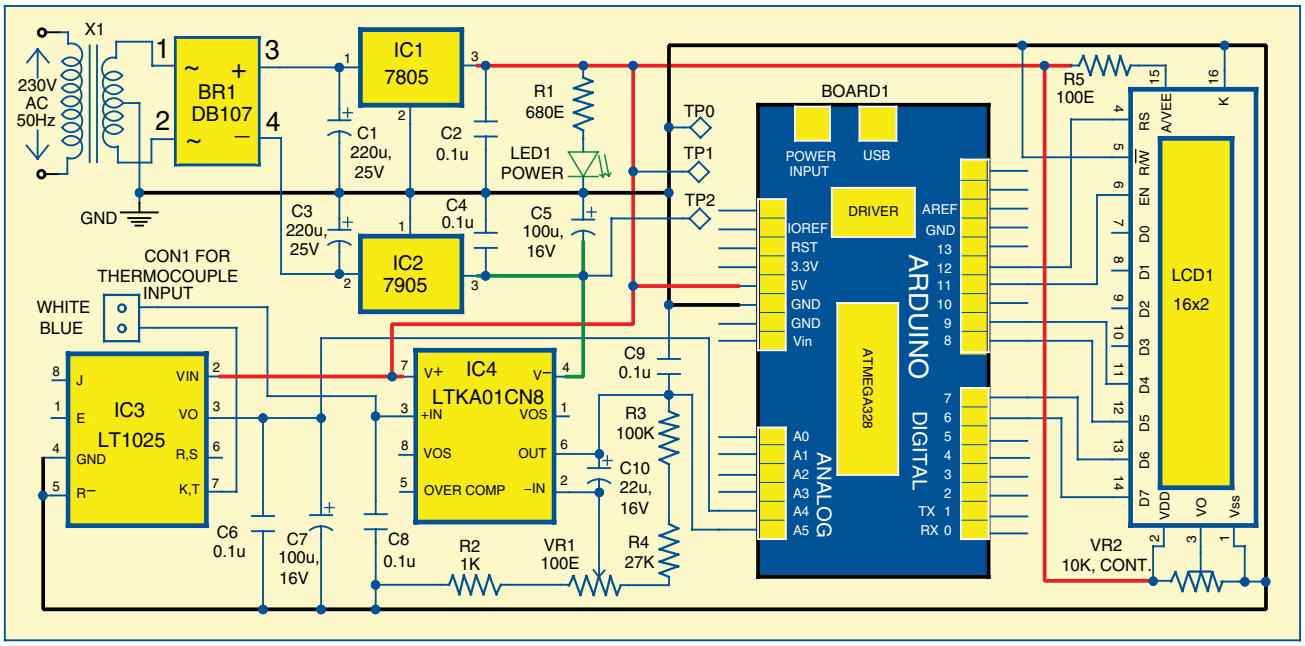


Fig. 3: Circuit diagram for interfacing a thermocouple with Arduino

TABLE I
Typical Examples of Selected Popular Thermocouples

Thermocouple type	Positive conductor	Negative conductor	Temperature range (°C)	Seebeck coefficient at +20°C
J	Chromel	Constantan	0 to 760	51μV/°C
K	Chromel	Alumel	-200 to +1370	40.6μV/°C
E	Chromel	Constantan	-100 to +1000	62μV/°C
S	Platinum (10 per cent Rhodium)	Rhodium	0 to 1750	7μV/°C

pheres. These thermocouples have a low Seebeck coefficient and relatively high cost. S type thermocouples allow measurements with precision up to ±1°C and require a relatively complex linearisation calculation algorithm.

Output of K type thermocouple is shown in Fig. 2. Slight non-linearity is reflected in the output due to properties of metal at increased temperature.

Circuit and working

Circuit diagram of the circuit for interfacing a thermocouple with Arduino is shown in Fig. 3. It is built around 230V AC primary to 12V, 300mA secondary transformer X1, bridge rectifier DB107 (BR1), +5V voltage regulator 7805 (IC1), -5V voltage regulator 7905 (IC2), cold-junction compensator LT1025 (IC3), op-amp LTKA01CN8 (IC4), Arduino UNO (Board1) and a few other components.

230V AC mains is stepped down to 12V AC, 300mA through step-down transformer X1. Secondary output of X1 goes to bridge rectifier BR1. Capacitors C1 and C3 filter the ripples and the rectified output is given to regulators 7805 (IC1) and 7905 (IC2). IC1 provides +5V and IC2 provides -5V regulated DC output to operate the circuit. LED1 is used as a power-on indicator.

IC3 gives K type output at its pin 7. Operating temperature range of IC3 is –55°C to 125°C. Vo pin 3 of IC3 is externally pulled down with two capacitors so that it can deliver proper outputs for temperature below 0°. Vo signal is fed to the analogue pin (A4) of Board1.

PARTS LIST

Semiconductors:
IC1 - 7805, 5V regulator
IC2 - 7905, -5V regulator
IC3 - LT1025 cold-junction compensator
IC4 - LTKA01CN8 op-amp
BR1 - DB107 bridge rectifier
BOARD1 - Arduino UNO (ATmega328)
LED1 - 5 mm LED
LCD1 - 16×2 alphanumeric display

Resistors (all 1/4-watt, ±5% carbon):
R1 - 680-ohm
R2 - 1-kilo-ohm
R3 - 100-kilo-ohm
R4 - 27-kilo-ohm
R5 - 100-ohm
VR1 - 100-ohm potmeter
VR2 - 10-kilo-ohm preset

Capacitors:
C1, C3 - 220μF, 25V electrolytic
C2, C4, C6, C8, C9 - 0.1μF ceramic disk
C5, C7 - 100μF, 16V electrolytic
C10 - 22μF, 16V electrolytic

Miscellaneous:
CON1 - 2-pin connector terminal
X1 - 230V AC primary to 12V, 300mA secondary transformer
- K type thermocouple

The thermocouple is connected to connector CON1. This is the input point for IC3 and IC4. Input could be from any thermocouple. This project was tested with J type and K type thermocouples.

Net output is amplified by IC4 for 5mV/°C sensitivity. For higher sen-

sitivity, choose feedback accordingly or scaling factor, likewise. Operating temperature range of IC4 is 0°C to 70°C. Pin 3 (+IN) of IC4 is connected to the other terminal of CON1. Pin 4 (V-) of IC4 is provided with -5V. Pin 2 (-IN) of IC4 is connected to potmeter VR1, which is used to set the amplifier gain.

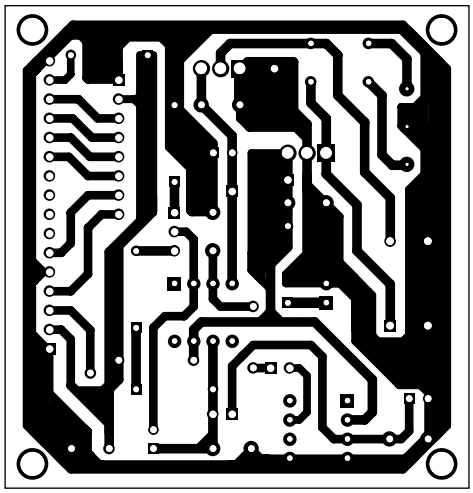


Fig. 4: Actual-size PCB layout of the circuit for interfacing a thermocouple with Arduino

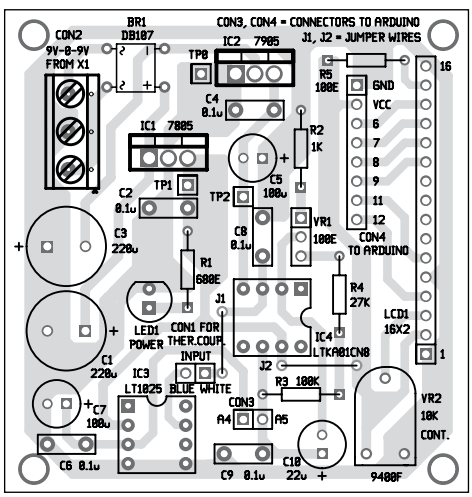


Fig. 5: Component layout of the PCB

Here, we have taken an amplifier gain of about 123. By varying VR1, you can change the amplifier gain. Output pin 6 of IC4 is connected to the analogue pin (A5) of Board1.

Arduino UNO (Board1) is a microcontroller (MCU) board based on ATmega328. It has 13 digital pins and six analogue input pins. Here, we are getting analogue inputs from IC3 and IC4. These analogue inputs are converted into digital outputs, which are displayed on the LCD (LCD1) that is connected to digital pin 6 through digital pin 9 of Board1, operating in 4-bit mode.

Software

Circuit operation is done using the software program loaded into the internal memory of Arduino UNO. The program implements all required functionalities including handling user inputs through the thermocouple, converting analogue readings to digital and displaying output on the LCD. The program is written in Arduino programming language sketch. Arduino IDE is used to compile and upload the program.

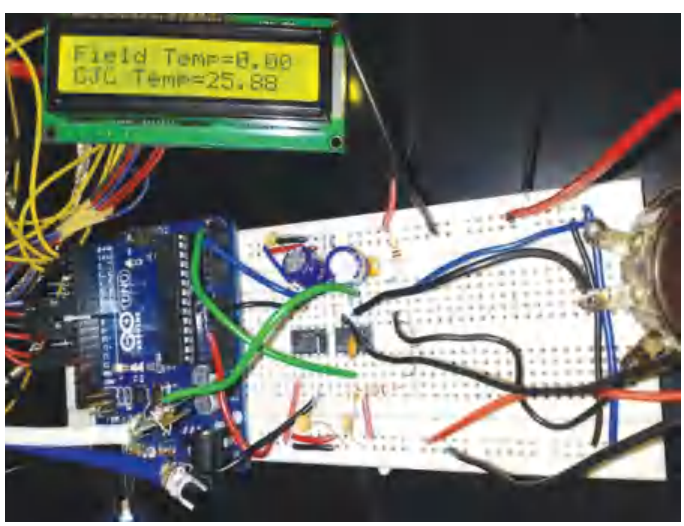


Fig. 6: Prototype on breadboard

Construction and testing

An actual-size, single-side PCB layout of the circuit for interfacing a thermocouple with Arduino is shown in Fig. 4 and its component layout is shown in Fig. 5. Mount all components on the PCB. It is recommended to use IC bases for IC3 and IC4.

Use a USB A-B cable to upload the compiled sketch (software) from the PC to MCU through Arduino IDE. Unplug the USB cable from the PC and connect Arduino board to CON4 in the PCB.

The operation is as follows:

1. Power on Arduino UNO board. You can view the LCD displays: Field Temp in the first row and CJC Temp in second as shown in Fig. 6. Here, CJC value, which is 25.88, is the room temperature in degree centigrade.

2. Vary 10-kilo-ohm preset VR2 to adjust the contrast of the LCD if the text is not clearly visible. For any other problem, you may verify the voltages at the test points given in Table II.

3. Dip the thermocouple in hot water. When the temperature across the thermocouple is changed, values of temperature on the LCD will also change. You will observe that Field Temp value on the LCD will start going up from 0°C. That means, analogue values from the thermocouple received in the Arduino board are converted into digital and corresponding values of the temperature are displayed on the LCD. ●

TABLE II
Test Points

Test point	Details
TP0	0V, GND
TP1	+5V
TP2	–5V

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*

Ronie Adhiraaj Ghosh is M.Tech from Homi Bhabha National Institute, Mumbai, and B.Tech from Asansol Engineering College, West Bengal. His hobbies include electronics projects, watch collection, camping and hiking

It's Good To Have A Choice!

ASSURED GIFT WITH EACH SUBSCRIPTION

GET DISCOUNTS

1 OR 2

SUBSCRIBE TO YOUR FAVOURITE MAGAZINES NOW!

Save Money. Get Gifts. Enjoy Your Favourite Magazine.

Option 1: Assured Gifts with every subscription

Magazine	Duration	Issues	Cover Price (₹)	You Pay (₹)	Assured Gift
Electronics For You	1 Year	12	720	720 ☐	☐ 8051 Kick-start Board with AVR+8051 USB Programmer (worth Rs 900)
	3 Years	36	2160	2160 ☐	☐ Arduino Uno Clone (worth Rs 1499)
	5 Years	60	3600	3600 ☐	☐ Robotics Self learning Kit (worth Rs 2500)
Electronics Bazaar	1 Year	12	1200	1200 ☐	☐ EFY Round Neck T-Shirt (worth Rs 300)
	3 Years	36	3600	3600 ☐	☐ Popcorn Maker (Worth Rs 1100)
	5 Years	60	6000	6000 ☐	☐ Toster Oven (Worth Rs 2000)
Open Source For You	1 Year	12	1200	1200 ☐	☐ OSFY Collered T-Shirt (Worth Rs 500)
	3 Years	36	3600	3600 ☐	☐ Coffee Maker (Worth Rs 1400)
	5 Years	60	6000	6000 ☐	☐ Toaster Oven (Worth Rs 2000)

Option 2: Upto 40% Discount Offer

Magazine	Duration	Issues	Cover Price (₹)	Discount	You Pay (₹)	You Save
Electronics For You	1 Year	12	720	20%	575 ☐	145
	3 Years	36	2160	30%	1515 ☐	645
	5 Years	60	3600	40%	2160 ☐	1440
Electronics Bazaar	1 Year	12	1200	20%	960 ☐	240
	3 Years	36	3600	30%	2515 ☐	1080
	5 Years	60	6000	40%	3595 ☐	2400
Open Source For You	1 Year	12	1200	20%	960 ☐	240
	3 Years	36	3600	30%	2520 ☐	1080
	5 Years	60	6000	40%	3600 ☐	2400

Offer Valid till 30th September 2015

Introducing EFY's Premium Edition

Electronics For You PLUS
(With software-packed DVD)

☐ 1 Year (12 Issues) ~~1200~~ ₹ **960**

☐ 2 Yrs (24 Issues) ~~2400~~ ₹ **1800**

Free e-zine Access With Every Subscription

To Subscribe Online,
Visit: http://subscribe.efyindia.com

For Online Renewal,
Visit: http://renew.efyindia.com

- Don't Miss A Single Issue!
- Ensure Regular Supply
- FREE Replacement Policy*
- Order Now For FREE Home Delivery

Name_____ MailingAddress_____

City_____ Pin Code_____ State_____ Phone_____ Email_____ Subscription No. (for existing subscribers only_____)

I would like to subscribe to the above (✓)marked magazine(s) starting with the next issue. Please find enclosed a sum of Rs_____ by DD/MO/crossed cheque*bearing the No._____ dt._____ in favour of **EFY Enterprises Pvt Ltd,** payable at Delhi.

*(*Please add Rs 50 on non-metro cheque)*

Send this filled-in form or its photocopy to : **EFY Enterprises Pvt Ltd** D-87/1, Okhla Industrial Area, Phase 1, New Delhi 110 020 | Ph: **011-26810601-03** | Fax: **011-26817563** | e-mail: **info@efy.in** | **www.efy.in**

EFYGROUP

Terms:- # These rates are applicable for new subscribers as well as renewal by existing subscribers. # Gift items' photos are representative and actual product may vary # The rates are valid for subscribers within India only. # Please allow 4-6 weeks for processing of your subscription. # Disputes, if any, are subject to exclusive jurisdiction of competent courts and forums in Delhi/New Delhi only. * Replacement will be made if intimation of damaged / non-receipt of copies is received within 30 days of its publication ** After three months, if you are not satisfied with the magazine, your balance amount will be returned

Fire Alarm Using a Thermistor

PRADEEP G.

This project can effectively be used as a temperature-sensing fire alarm. Here, an NTC thermistor is used as the temperature sensor. Resistance of the NTC thermistor decreases with an increase in temperature.

Circuit and working

Circuit diagram of the fire alarm is shown in Fig. 1. It is built around NTC thermistor (NTC1), transistor BC547 (T1), popular NE555 timers (IC1 and IC2), speaker and a few other components.

In this circuit, the two NE555 timers are wired as astable multivibrators. IC1 is wired as a low-frequency generator and IC2 as a high-frequency generator.

PARTS LIST

Semiconductors:
IC1, IC2 - NE555 timer
T1 - BC547 npn transistor
LED1 - 5mm LED

Resistors (all 1/4-watt, ±5% carbon):
R1 - 22-kilo-ohm
R2 - 4.7-kilo-ohm
R3, R6 - 1-kilo-ohm
R4, R7 - 56-kilo-ohm
R5 - 680-ohm
R8 - 10-ohm
VR1 - 100-kilo-ohm potmeter

Capacitors:
C1, C6 - 100µF, 25V electrolytic
C2 - 2.2µF, 25V electrolytic
C3, C5 - 0.01µF ceramic disk
C4 - 0.047µF ceramic disk

Miscellaneous:
CON1 - 2-pin connector terminal
S1 - On/off switch
NTC1 - 10-kilo-ohm NTC thermistor
LS1 - 8-ohm, 0.5W speaker

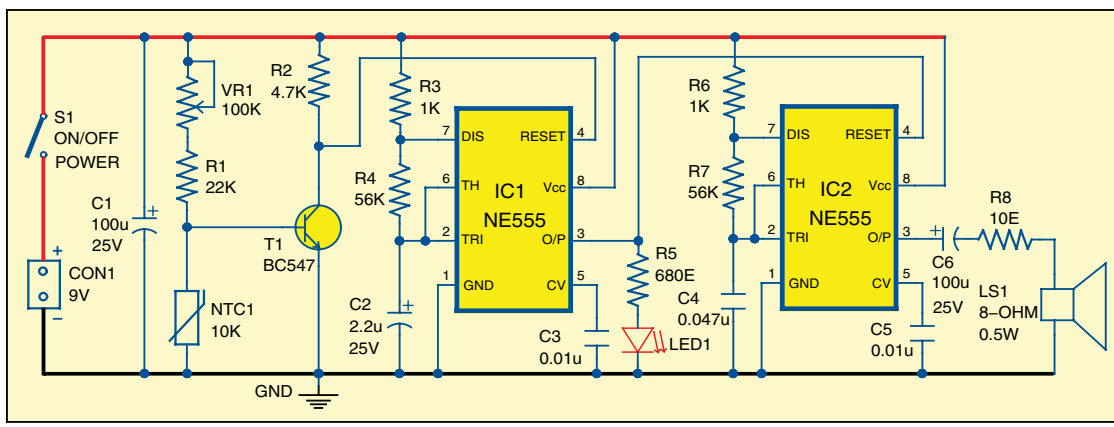


Fig. 1: Circuit diagram of the fire alarm

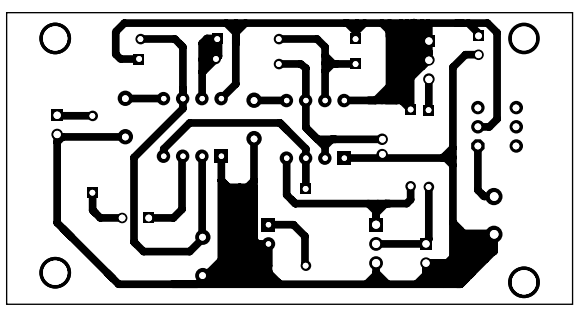


Fig. 2: Actual-size PCB pattern of the circuit for the fire alarm

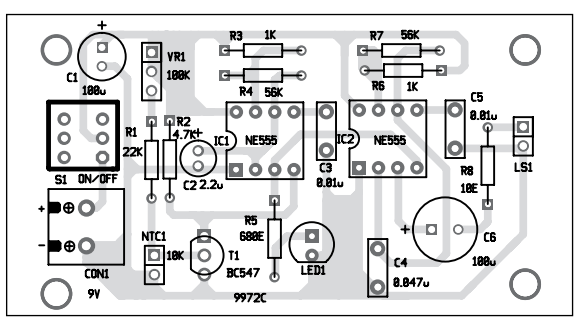


Fig. 3: Component layout of the PCB shown in Fig. 2

At room temperature, transistor T1 conducts and keeps reset pin 4 of IC1 at ground level. As a result, both timer ICs are disabled. But when temperature of the sensor goes above 70°C (depending on the thermistor constant [K]), transistor T1 stops conducting. Both NE555 timers oscillate and a beeping sound is heard from the speaker.

Potmeter VR1 is used to set the cut-off/saturation condition of transistor T1, which is related to the resistance of NTC1 at different temperatures. At room temperature, voltage at pin 4 of IC1 remains low. With heating of NTC1, voltage at pin 4 of IC1 becomes high. This enables both the timer ICs to oscillate and produce sound through the speaker. Also, LED1 starts flashing.

The circuit works on 9V regulated power supply. For a louder sound, you may add a speaker driver circuit with matched impedance.

Construction and testing

An actual-size, single-side PCB for the fire alarm circuit is shown in Fig. 2 and its component layout in Fig. 3. Enclose the PCB in a small box in such a way that the thermistor can sense the temperature in case of fire. ●

Pradeep G. is B.Sc. (Physics) and a regular contributor to international magazines. He is also a small-business owner making school/college projects in south India

Which is Your Favorite SIGLENT X-Instrument?

New Instruments, Higher Performance and Lower Cost!

NEW

SDS1000X Series

Super Phosphor Oscilloscope

Model	SDS1102X	SDS1102X-S	SDS1202X	SDS1202X-S
Bandwidth	100MHz		200MHz	
Sample Rate (Max)	1GSa/s			
Channels	2+EXT			
Memory Depth (Max)	7Mpts/CH (Dual-Channel); 14Mpts/CH (Single-Channel)			
Waveform Capture Rate (Max)	60,000 wfms/s			
Trigger Type	Edge, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video			
Serial Trigger(Optional)	IIC, SPI, UART/RS232, CAN, LIN			
Decode Type(Optional)	IIC, SPI, UART/RS232, CAN, LIN			
DDS Waveform Generator	No	Yes	No	Yes
	Single Channel, Max Frequency up to 25MHz,125 MSa/s waveform generation Capabilities, wave length 16Kpts			
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out, 1KHz Cal			
Probe(Std)	2 pcs passive probe PP510		2 pcs passive probe PP215	
Display	8 inch TFT LCD (800x480)			

SDG2000X Series

Function/Arbitrary Waveform Generator

Proprietary Technology: TrueArb and EasyPulse

Model	SDG2042X	SDG2082X	SDG2122X
Bandwidth	40 MHz	80 MHz	120 MHz
Channels	2		
Sample Rate (Max)	1.2 GSa/s		
Waveform length (Max)	8 Mpts		
Vertical Resolution	16 Bit		
Display	4.3" touch screen display, 480 x 272 x RGB		

SPD3000X Series

Programmable DC Power Supply

Model	SPD3303X	SPD3303X-E
Channels	Three independently controlled isolated outputs	
Max Output Power	220 W	
Min Resolution	1mV/1mA	10mV/10mA
Features	Timing output, Waveform display	
Interfaces	USB Device, LAN, supports LabView driver	

SIGLENT®

SIGLENT TECHNOLOGIES CO., LTD.
Add: Blog No.4 & No.5, Antongda Industrial Zone, 3rd Liuxian Road, Bao'an District, Shenzhen, 518101, China.
Tel: + 86 755 3661 5186; Email: sales@siglent.com; Website:http://www.siglent.com/ens/.

Faraday's Guitar

BALAJI RAMALINGAM

Experimenting with the fundamentals of electrical and electronics is always interesting. Presented here is an electronic circuit that demonstrates Faraday's law of electromagnetic induction and gives musical output. The law talks about electromagnetic induction and production of electromotive force (EMF) across a conductor when it is exposed to a varying magnetic field.

To experience this, place a stretched copper wire near a magnet. When you pluck the wire and it vibrates, EMF is produced in the copper wire and it produces musical notes.

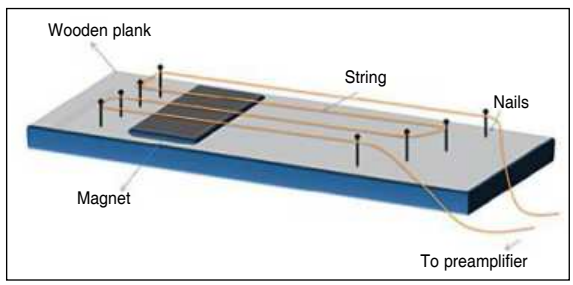


Fig. 1: Typical amateur guitar construction

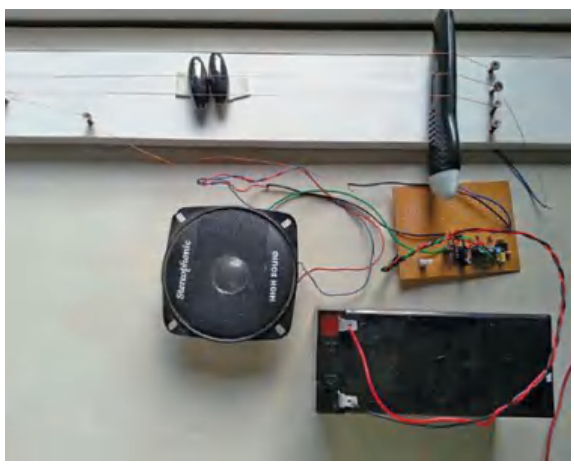


Fig. 2: Author's prototype

You can make an amateur guitar with a copper string and magnet as shown in Fig. 1. While strumming the string, a small voltage is produced due to Faraday's law. When this voltage is amplified, you can hear a pleasant sound from the speaker connected to the power amplifier. The author's prototype is shown in Fig. 2.

Circuit and working

Circuit diagram of Faraday's guitar is shown in Fig. 3. It is built around transistors BC549 (T1 and T2), low-power audio amplifier LM386 (IC1), a speaker (LS1) and a few other components. The circuit is powered by 12V battery. An on/off toggle switch (S1) is used to switch on the circuit.

The two-stage preamplifier is designed with BC549 transistors to amplify the low signal produced by guitar string. Voltage produced by the string will be in the range of ~3mV and the preamplifier amplifies the signal further to ~20mV. Resistors R1, R2 and R4 form the biasing circuit to the transistors. Capacitors C1 and C3 are bypass capacitors that allow sound signals and block DC components. Resistor R5 and capacitor C5 form an RC filter for the power supply of the preamplifier circuit.

LM386 (IC1) is a low-voltage audio power amplifier, which is suitable for battery-powered devices for hobby projects. Capacitor C8 between pin 1 and pin 8 decides the gain of the amplifier, and here it is set to 200.

Volume control VR1 is connected between output of the preamplifier and input of the power amplifier. For testing, connect the string to the preamplifier circuit and power up by closing switch S1. If you strum the string, you will hear guitar notes from the speaker. Ensure there is right tension on the strings so that the longer tone notes are achieved. You can have different string lengths so that distinct tones could be heard from each string.

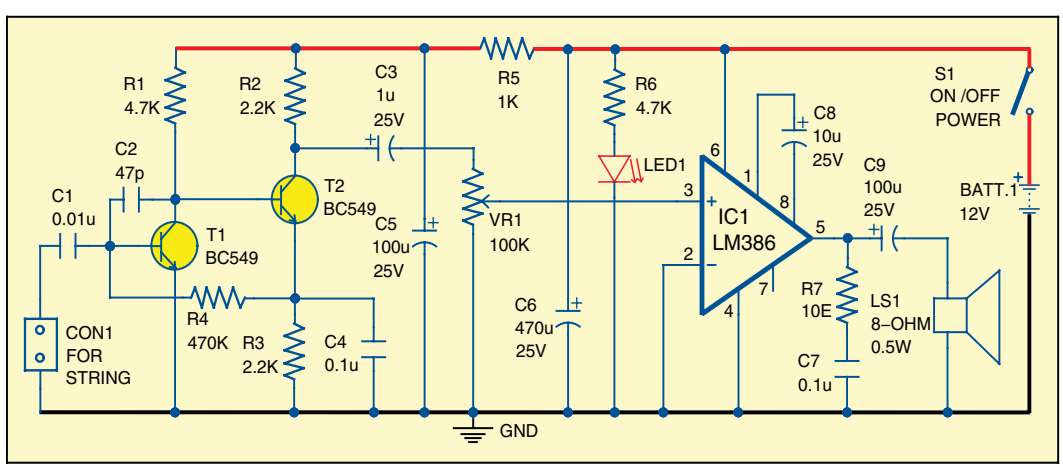


Fig. 3: Faraday's guitar circuit diagram

Construction and testing

An actual-size, single-side PCB for Faraday's guitar circuit is shown in Fig. 4 and its component layout in Fig. 5. En-

PARTS LIST

Semiconductors:

IC1	- LM386 low-power audio amplifier
T1, T2	- BC549 npn transistor
LED1	- 5mm LED

Resistors (all 1/4-watt, ±5% carbon):

R1, R6	- 4.7-kilo-ohm
R2, R3	- 2.2-kilo-ohm
R4	- 470-kilo-ohm
R5	- 1-kilo-ohm
R7	- 10-ohm
VR1	- 100-kilo-ohm potmeter

Capacitors:

C1	- 0.01µF ceramic disk
C2	- 47pF ceramic disk
C3	- 1µF, 25V electrolytic
C4, C7	- 0.1µF ceramic disk
C5, C9	- 100µF, 25V electrolytic
C6	- 470µF, 25V electrolytic
C8	- 10µF, 25V electrolytic

Miscellaneous:

CON1	- 2-pin connector
BATT.1	- 12V battery
S1	- On/off switch
LS1	- 8-ohm, 0.5W speaker
	- 2-pin connector terminal for battery

close the PCB in a suitable box and place it near the guitar.

For construction of the guitar, take a wooden plank measuring approximately 10cm × 30cm and put four nails on either side as shown in Fig. 1. Tie a copper wire (string) between the nails with correct tension. The copper wire can be taken out from any transformer with 500mA secondary rating.

Ensure that a single string is passed between all the nails without joints or breaks. Place a magnet on the wooden plank roughly below the middle of the string and ensure the gap is small between the string and the magnet. The produced EMF depends on the air gap between the magnet and the string. If the magnet touches the string, it may obstruct the vibration of the string and the produced EMF would be low. If the gap is too much then, due to weak magnetic linkage, EMF will be lower. Therefore keep the magnet as close as possible to get higher EMF. ●

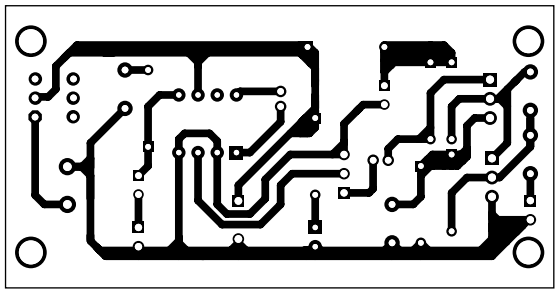


Fig. 4: Actual-size PCB of Faraday's guitar

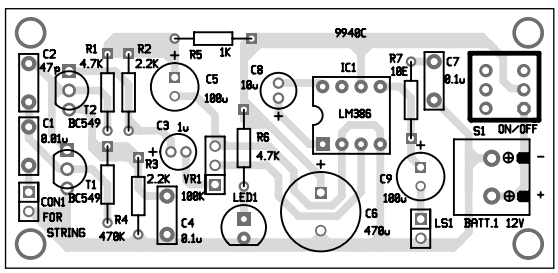


Fig. 5: Component layout of the PCB

Balaji Ramalingam is working as a technical expert at Robert Bosch, Bengaluru. He has filed several patents for automotive electronics and published papers in SAE conferences and several international magazines

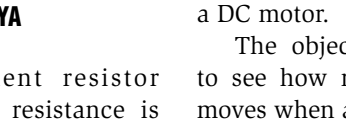
LDR Based DC Motor Speed Control

SUMANTRA BHATTACHARYA

A light-dependent resistor (LDR) whose resistance is inversely proportional to the intensity of light is often used as a sensor in electronic projects that involve the use of light. This project uses an LDR to control the speed of a DC motor.

The objective of this project is to see how much faster the motor moves when a hand is brought closer to it. This circuit could be very useful in applications where one tries to control the movement of a robot using a wired/wireless channel, keeping different arrangements of LDR and transmitting the same through the channel to the receiving side, where the movement of the robot can be controlled. It has been developed and tested keeping this vision in mind.

Fig. 1: Author's prototype



PARTS LIST

Semiconductors:	
U1	- Arduino Uno board
LDR	- A small light-dependent resistor
CON1	- (+5V) DC supply and LDR interface
CON2	- (+5V) DC motor interface
R1	- 10k, 1/4-watt, ±5%

Circuit and working

The circuit uses a small LDR, which is sensitive to the intensity of light. Voltages generated from the LDR are compared using an internal ADC of Arduino Uno, which turns on as light intensity goes above a certain voltage threshold. This voltage has already been calibrated for specific positions of the hand with respect to the LDR.

TABLE I
Values Coming from ADC and Their Division

Hand position with respect to the LDR	Value range of Arduino Uno ADC/4	Speed of motor PWM output
No hand/obstruction	0<value<60	Stop/ 0
First position	60<value<200	Medium /40
Second postion	200<value<255	Full/255

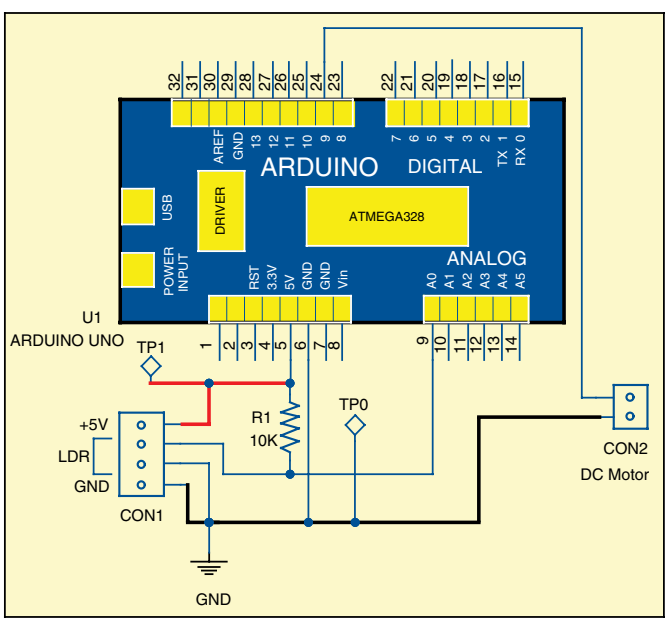


Fig. 2: Circuit diagram of the LDR based DC motor speed control

In this project three variations in speeds are considered: stop, medium and high. Readings from the LDR are taken by analogue pin A0 using a voltage divider circuit consisting of 10k resistance and LDR connected at CON1 as shown.

Arduino Uno has a 10-bit ADC and its value ranges from zero to 1024. But, the pulse-width modulation (PWM) output from Arduino ranges from zero to 255. Thus, values coming from the ADC decrease by four times. These are divided into three ranges as shown in Table I.

Software programme

```
if(val<60) analogWrite(9,0);
```

If 60 > LDR output, send PWM (0) value to pin 9 of Arduino Uno.

```
if(val>60 && val<200) analogWrite(9,40);
```

If 60 < LDR output < 200, send PWM (40) value to pin 9 of Arduino Uno for medium speed.

```
if(val>200 && val<255)
analogWrite(9,255);
```

If 200 < LDR output < 255, send PWM (255) value to pin 9 of Arduino Uno for fast speed.

EFY note. LDR based speed variation is a very easy way of varying the speed of a DC motor. Change in speed from one to another is very smooth. But the number of distinct variations in speed is less. Only three prominent variations in 5V could be observed. ●

Sumantra Bhattacharya is M.Tech (mechatronics) from IIEST

Smart Industries

by analog & power devices

Combining innovative manufacturing with advanced semiconductor technology

Motor Control and Drive

1ch Gate Driver with built-in Galvanic Isolation

- Isolation voltage : 2,500Vrms
- I/O Delay : 150ns(Max.)
- Iout : 3A(Max.)
- OSFB(Output State Feed Back) function built-in
- Multiple protection functions (Desat, SCP, Miller clamp, UVLO, Fault output)

Power Supply

AC/DC Driver ICs with Built-In 650V SJ-MOSFET

- Power consumption and efficiency at standby with a 25W adapter
  Less than 20mW and over 87% at 100VAC
  Less than 30mW and over 86.4% at 230VAC
- SW frequency : 65KHz(Max.)
- 650V startup circuit built-in

Next-Generation Power Devices

Integrated in-house production from wafer processing to package and module manufacturing for SiC Power Devices

- Full SiC Modules
  1200V(120A/180A/300A)
- MOSFETs
  1200V(10A to 40A)/650V(29A)
- Schottky Diodes
  1200V(5A to 40A)/650V(6A to 40A)

Communication

Wi-SUN module

"Wi-SUN" (Wireless Smart Utility Network) Compatible with International Wireless Communication standards with 920MHz band with Low-power consumption & stable connectivity. Integrated Firmware ideal for HEMS-applications, Smart meters.

Compact

Power-Saving

High Performance

High Reliability

ROHM's Key-devices

contribute to a sustainable society through advanced technology

Register at "MyROHM"!

- Use ROHM's eLAB - Design Simulation Software
- Tag 'Favorite' Products or Product Categories and receive email update alerts
- Receive ROHM Newsletter, highlighting the latest product information
- Save customized Parametric Searches for future reference

http://www.rohm.com/web/in/registration

ROHM Co.,Ltd.
Japan(HQ) / The Americas / Europe / Asia
India www.rohm.com/in
[Chennai / New Delhi / Pune / Bangalore]
Phone:+91(80)4125-0811 E-mail:info@rohm.in

ROHM SEMICONDUCTOR

Lift Indications

SOMNATH BERA AND AKHILESH SINGH

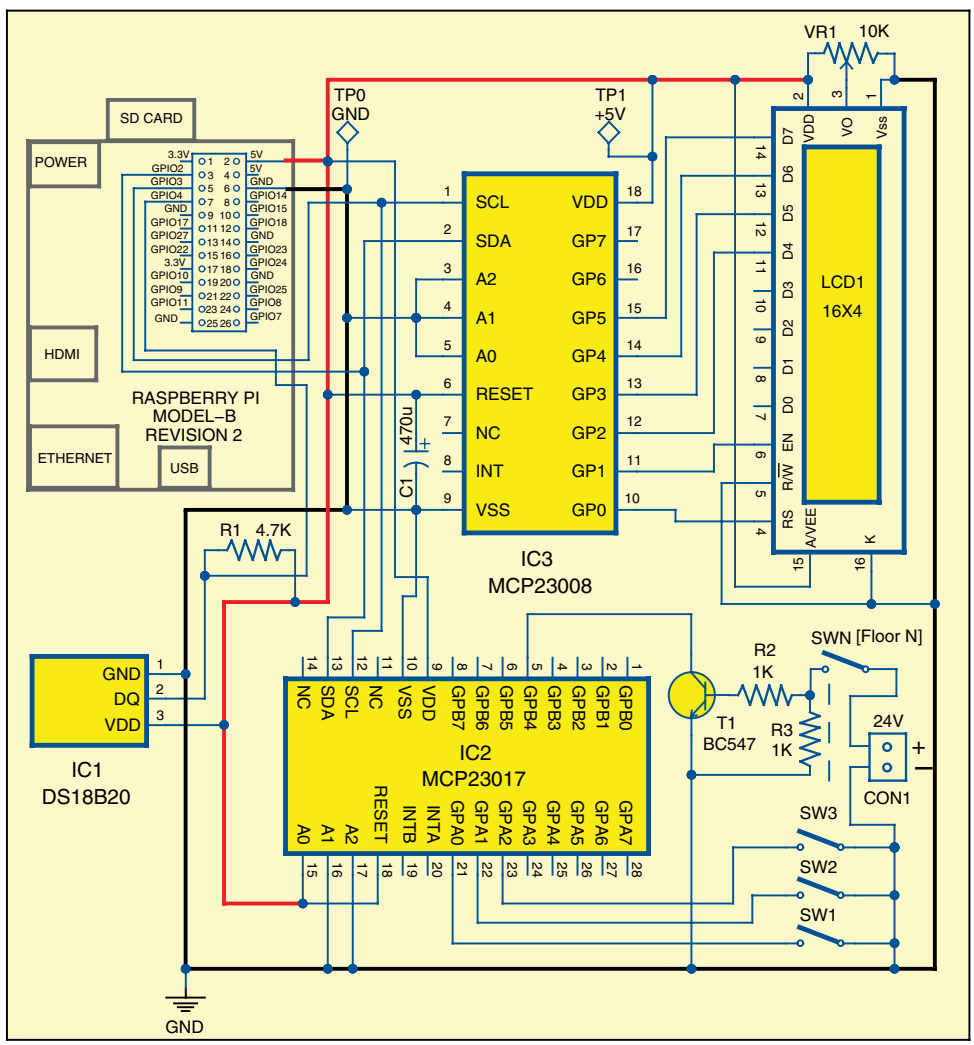
Represented here is a project on lifts' indications. It consists of Raspberry Pi (Raspi), MCP23008 8-bit I/O expander with serial interface, MCP23017 16-bit I/O expander with serial interface, DS18B20 digital thermometer, an alphanumeric 16 × 4 LCD and a few other components.

Many a time, we, in the industry, limit ourselves due to the overwhelming nature of proprietary items, combined with lack of money, to renovate and modernise old equipment. Even though it is no longer under warranty, we are still afraid to carry out the maintenance work ourselves and often wait for the OEM to do it for us. We usually end up paying a hefty fee, too.

One such item is a boiler lift. We have quite a large number of these behemoths that still work but keep breaking down, requiring maintenance and eventual replacement over the years. One of the many problems with these lifts is that for indications, these use +24V DC, which lights small bulbs and on a number of occasions the bulbs fuse. On top of this, these special long-glass incandescent bulbs are not easily available in the market.

To solve this problem, we tried using LEDs but these cause other problems. Even when there is no indication, due to the threshold limit, voltages present in the indication line and the LEDs never go off—so these keep glowing.

When my electrical maintenance guy expressed complete helplessness over this problem, I talked to him and after some trial and error, came out with an elegant solution. At the heart of the solution lies Raspi computer, and the lift cage indications are completely replaced by a sophisticated 16 × 4 LCD panel, which shows temperature, clock, floor number and even makes audio announcement for floor numbers like the ones we find in modern Otis or Kone capsule lifts.



Circuit diagram for lift indications

Raspi in action

We tried to build this project on Arduino but due to Arduino's limitations on audio voice reproduction, we shifted to Raspi. However, due to limitations of GPIOs on Raspi, we tied up one MCP23008 and MCP23017 each on I2C bus, so that the MCP23008 is used for running the 16 × 4 character LCD display for display purpose and the MCP23017 is used for receiving input signals from the several landings floors.

MCP23017 has 16 GPIOs, which can all be used for switching; it can provide indications for lift systems with up to 16 floors. Add one more MCP23017 and you can add another 16 floors.

Circuit and working

Normally, in an elevator system, when the carriage arrives at a landing, it throws a crowbar, which, in turn, actuates a number of switches. These switches may be on the +24V side or on the ground side. In our case, these are on the ground side, which means the +24V indication lamps have the +24V side already connected and ready. And when the switch actuates, it sends the ground connection to the bulb to switch it on.

Similarly, when the carriage moves past that landing, the crowbar releases the switch along with the ground connections, and the bulb goes off. However, for some older lifts, these signals come from the +24V side rather than the ground. These are then inverted using a simple transistor (BC547) switching technique as shown in the schematic (see Floor N). After inverting these, these can be used again, as shown in the schematic.

We pick up ground connections (using SW1, SW2 and SW3) for our Raspi based indications. All these connections reach inside the carriage as well as outside the landings. Inside and outside indication is a series of horizontal +24V bulbs placed under a bar, indicating the floor numbers. When the lift cage reaches a floor, the bulb under that floor number glows.

To have different addresses on I2C bus of MCP23008 and MCP23017, we have connected the address ports in different ways to have 0x20 and 0x21 as addresses of these two different MCPs. Python script runs at boot level and monitors the GPIOs of MCP23017. The moment one landing arrives, it shorts the concerned GPIO with the ground, thereby switching the respective MP3 file and the LCD panel showing the respective floor number, besides the clock and temperature signals. Temperature sensor DS18B20 is used for sensing lift-cage temperature.

Important notes

Important note 1. The software is built on Raspi version 1 board. For running it on version 2 board, we need to make some changes in the following files:

lcd23008.py
Adafruit_MCP230xx.py
lift_light.py
lift-light-with-espeak.py

Where it needs to be changed, it is marked clearly like:

use busnum=0 for Raspi version 1 (256MB) and busnum=1 for Raspi version 2

Important note 2. In case you are using the latest Raspbian OS, add the following lines:

in /boot/config.txt & reboot

$sudo nano /boot/config.txt

dtparam=spi=on
dtparam=i2c_arm=on
dtoverlay=w1-gpio

Save nano by ctrl+o and then exit by ctrl+x.

Make the changes accordingly and then reboot to make the effects permanent.

Program

The program is built using easy Python scripts. Additional software that we have used are all free Adafruit libraries for manipulating the GPIOs of MCP230xx, one Python GPIO for manipulating the software and one mpg321 for playing MP3 files. Adafruit libraries may be copied from my repository here.

https://drive.google.com/file/d/0B3E3LcSKoM-6S21ZUnZ0d-WZJRGs/edit?usp=sharing

However, mpg321 and GPIOs have to be installed from the Internet.

mpg321 may be installed using the following command:

```
$> sudo apt-get install mpg321
```

Operation

MP3 files are to be made separately from recordings using anorak or some other recording program. Each MP3 will speak about different floors, namely, first floor, second floor, third floor and so on.

A small speaker amplifier is added to the audio-out port of Raspi. Power supply of the audio amplifier is taken separately (normally, 6V/12V). To run the program at boot level, so that every time Raspi restarts after any power failure, add the following line at /etc/rc.local file:

```
$> sudo nano /etc/rc.local
```

#add this line before exit command:

```
sudo python lift_light.py &
```

Save nano with ctrl+o and then exit with ctrl+x

To run the program from the command line, use:

```
$> sudo python lift_light.py &
```

Alternate software

To get rid of MP3 files, we can train our Raspi to use a synthesiser program to speak up. There are many voice synthesiser software available online, but eSpeak is the most versatile and it comes free of cost. The other voice synthesiser software are

Festival, pico and cepstral (*www.cepstral.com/raspberrypi*).

eSpeak produces good-quality English speech. It uses a different synthesis method from other open source text to speech (TTS) engines and sounds quite different. It is perhaps not as natural or smooth, but its articulation is clearer and easier to listen to for long periods.

```
$> sudo apt-get update
$> sudo apt-get upgrade
$> sudo apt-get install alsa-utils
```

Edit /etc/modules file to include the following line beside its other lines:

```
$> sudo nano /etc/modules
 snd_bcm2835
```

Save nano with ctrl + o and then exit with ctrl + x.

```
$> sudo reboot
```

This command will reboot Raspi.

Complete the installation by adding the following software:

```
$> sudo apt-get install mplayer
$> sudo apt-get install espeak
$> sudo apt-get install espeak-gui
```

To learn about the manual of eSpeak, use:

```
$> man espeak
```

or

```
$> espeak --h
```

The last command will give you detailed options about how to use eSpeak. Before testing eSpeak, attach an amplifier with Raspi audio socket, as the normal audio output does not have enough power to drive more than an earphone. By running eskeap-gui, you can pick the voice of your choice for the eSpeak synthesiser.

Given below are a few examples:

```
$> espeak "Hello Guys, welcome to EFY"
// male voice
$> espeak -ven+f3 "Hello, Welcome to
EFY" // female voice
$> espeak -ven+f3 -k9 -s150 -a200 "Hello
Guys, Welcome to EFY" //high pitched ,
well spaced, maximum amplitude female
voice
```

Now, run Python program lift-light-with-espeak.py and it will speak up those floor numbers bypassing the MP3 files.

```
$> sudo python lift-light-with-espeak.
py &
```

This Python program will work in a similar way, but it would not need MP3 files and the voice quality is pretty good. To run it at boot level, add it in /etc/rc.local file. ●

EFY Note

The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*

Somnath Bera is an avid user of open source software. Professionally, he is a thermal power expert and works as additional general manager at NTPC Ltd

Akhilesh Singh is working as electrical engineer in electrical maintenance department at NTPC Ltd

Analogue Clock Using MATLAB

P. MANICKARAJA

NASA might get a fancy digital-count display, retire the analogue clock from Apollo era but the passion for the analogue clock does not end. An analogue clock has moving hands, where the smaller one is the hours hand and travels 30° in one hour, and the longer one is the minutes hand and travels 360° in an hour. The seconds hand rotates with a step of 6°.

Software program

The coding is developed using MATLAB version 7.9.0.529 (or R2009b). MATLAB has a good collection of graphics commands for plotting and analysing complex signals. The built-in functions reduce the size of the program and provide the desired output.

Program logic. Circle with a radius of 10 units is drawn. Hours are marked from 1 to 12, 30° apart. System time such as your PC's is read by the command. According to the current time of your PC, the hours, minutes and seconds hands are displayed.

Commands used. The figure shows the screenshot of the program output. Commands used in the program for the analogue clock display are given below:

clock( ). This command extracts date, year and current time from the real-time system.

pause ( ). It provides the required time delay in seconds.

clc( ). It clears the command window.

EFY Note

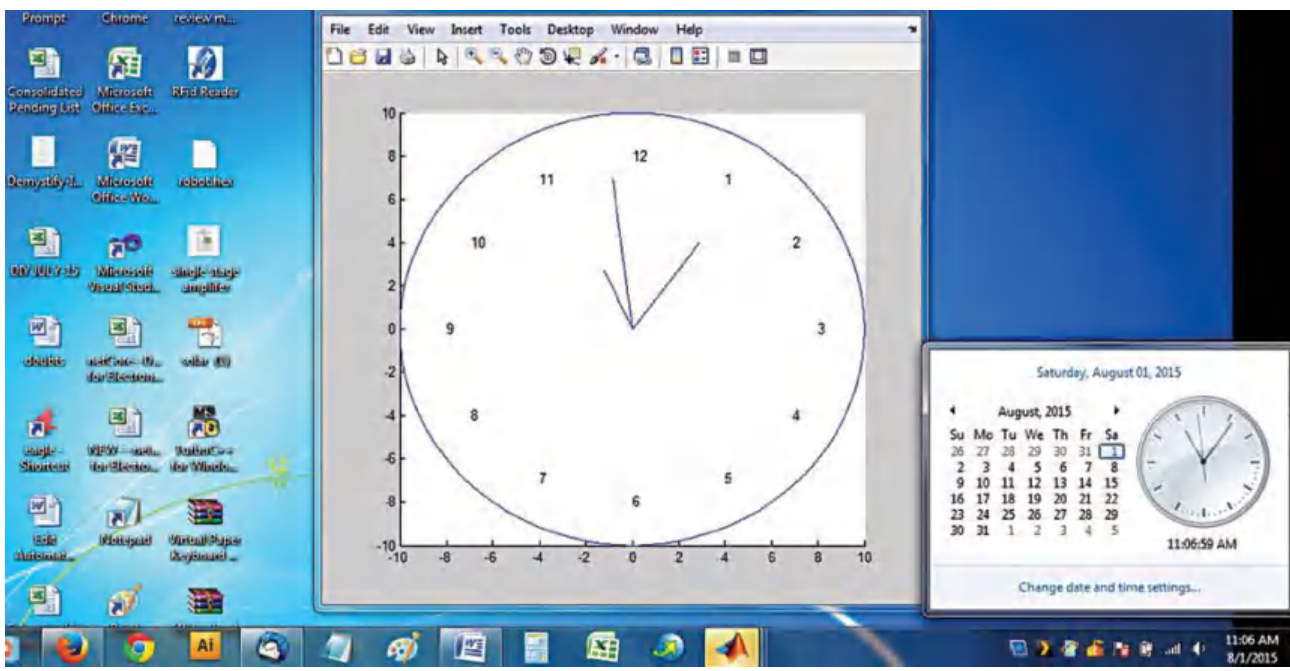
The source code of this project is included in this month's EFY DVD and is also available for free download at *source.efymag.com*

clear( ). It clears all variables.

textxy ( ). This command prints the text in the specified location, which is mentioned as x and y co-ordinates.

numtostr( ). It converts a number to string data type. ●

P. Manickaraja is masters in engineering in control and instrumentation from College of Engineering, Guindy, Tamil Nadu



Screenshot of the program output

Headphones by Mi

For a concert hall experience

The new Mi headphones features an acoustic system supported by a large 50mm diaphragm that is four times harder than steel and 60 per cent lighter than titanium alloy. It has the ability to retain a natural sound with minimal distortion and colouration, even at the highest ranges. The semi-open design reduces distortion and improves fidelity with a dual damping system that absorbs internally-reflected sound waves.

The built-in Knowles MEMS microphone provides excellent audio clarity for calls, supported by a silver-plated copper wire that does not cut off at the remote but runs right through it to ensure an optimal signal transmission. The 32-ohm low impedance allows for higher audio levels while running on less power.

Aluminium grilles on the headphones reduce resonance and maintain an open, breathable sound, while a leather-like band provides a snug and comfortable fit. It comes with soft PU ear cushions filled with quality foam that is perfect for extended wear.

Price: ₹ 5499

Full-HD Android TV from Sony

Bringing to you a world of online entertainment and easy connectivity

This 108cm (43-inch) full-HD TV promises the most immersive entertainment for its users. It works on Android Lollipop operating system and brings to you an exciting new entertainment experience with a dazzling world of content, apps, games and much more. You can get personalised content recommendations from Google Play, Serial AbTak, Youtube or enjoy cast or voice search.

The W950C BRAVIA features X-Reality PRO video processing, 16GB memory, Edge LED backlight module, a viewing angle of 178° (right to left) and 178° (up to down), dual acoustic duct sub-woofers and TRILUMINOS display, among others. The various picture modes include vivid, standard, custom, cinema pro, cinema home, sports, animation, photo-vivid, photo-standard, photo-custom, game and graphics.

Price: ₹ 82,900

Watchphone by Intex

A SIM-enabled smartwatch

With iRist, you can originate a call, send messages; also, the call can be heard and answered with just your wrist. This 3G-enabled smartwatch features a 3.9cm (1.56-inch) screen with 240 x 240 pixels with sapphire glass. The 600mAh battery is expected to keep your wrist alive for a day, without running after the charger sockets.

The iRist features 1.2GHz dual-core processor and 512MB RAM. It also comes with an inbuilt GPS, a pedometer, voice assistant and 5MP camera. It is dust and water resistant, supports Wi-Fi and Bluetooth. It comes in three colour variants, namely, black, orange and pink.

Price: ₹ 11,999

GizMo ByTes

An app for the visually impaired

Be My Eyes, the new iPhone app, uses cameras and generous guides to help the visually-impaired people to carry out their day-to-day activities more efficiently and with fewer difficulties. The app pairs the visually impaired with sighted people who help them with a number of tasks, such as counting money, choosing an outfit or browsing the Web.

Go green with Greenopia

Greenopia, the new mobile app, could do the job of a gardener. The technology not only helps to understand which plants grow in what climatic conditions, it also informs its user to understand the kind of material needed to grow these, the level at which seeds should be sown and the amount of water required for a particular plant.

Microsoft launches Send app

Technology giant Microsoft has launched a new app called Send to give its users a quick text-message-like experience even in emails. It removes the subject line and takes its users directly to the contacts list. The app does not require a subject line, signature or salutation. It displays frequent and recent contacts when you open it. The user can also see when the other person is typing a response, if he or she is also a Send user.

India's first social polling app

Whatsay enables its users to send visual polls in 25 categories to their friends and followers through various social network platforms like WhatsApp, Facebook, Twitter and Gmail. They can also add images or videos with the related post.

Logitech launches Bluetooth multi-device keyboard

A wireless desk keyboard for your computer, tablet and smartphone

This wireless keyboard supports Windows (Windows 7, 8 and 10), Mac (Mac OS X or later) or Chrome computers and Android (Android 3.2 or later) or iOS mobile devices (iPad or iPhone with iOS 5 or later).

It switches easily between devices; simply turn the Easy-Switch dial to switch typing between three connected Bluetooth wireless devices. The integrated cradle on the keyboard holds the phone or tablet at just the right angle for you to read while you type.

The keyboard is available in two colour variants, namely, black and white. It features a battery life of two years and Bluetooth range of up to 10m (30-feet). It measures 195mm x 299mm x 20mm (7.68-inch x 11.77-inch x 0.79-inch) and weighs 820 grams.

Price: ₹ **2795**

Pocket-size washing machine from Haier

World's first pocket-size washing machine

CODO, the world's first washing machine, features high-speed washing. It operates at the rate of 700 beats per minute and removes fresh stains magically in 30 seconds. With precise cleaning, it cleans the stain area precisely without spoiling the fabric.

CODO weighs 300gm and measures 46mm x 46mm x 176mm. It works on three AAA pencil batteries.

Price: ₹ **4990**

What to Look for in a UHD TV

Sushma Rani is a content-developer-cum-sub-editor at EFY

UHD televisions, or 4K ultra-HD TVs, are gaining popularity these days. Over a period of time, these TVs are starting to become affordable, ranging from good-size displays to high-end models.

Today, everyone wants to know about UHD TVs and own one, but they must know why these are in trend and capturing a high demand in 2015.

As per market trends, UHD is the next big thing in high-definition TV (HD TV) resolution. Technically, UHD is a derivation of the 4K digital cinema standard. UHD TV is a digital TV display format in which the horizontal screen resolution is around 4000 pixels (4K UHD) or 8000 pixels (8K UHD). It sure sounds impressive, with super-detailed pictures that have four times (or more) as many pixels as a 1080p HD set.

On October 17, 2012, Consumer Electronics Association (CEA) made an announcement that the official term ultra HD would be used for any display with a 16 × 9 ratio, with at least one digital input cable carrying a minimum resolution of 3840 × 2160 square pixels.

Now, a large number of manufacturers are producing fewer full-HD TVs and more 4K TVs and the year 2015 is witnessing huge growth in the 4K segment. UHD TV sets are now available from most of the major TV manufacturers and they provide these products with advanced technology.

In this article, we list out some key features that are important for buyers in finding the right UHD TV for their needs.

The UHD TV resolution

UHD TV offers almost four times the resolution of mainstream 1080p flat screens. Currently, there are two forms of UHD, namely, 4K and 8K, and both have an aspect ratio of 16:9.

4K UHD (2160p) has a resolution of 3840 × 2160 (8.3MP), which is roughly equivalent to 4K cinema.

8K UHD (4320p) produces 7680 × 4320 pixel resolution (33.2MP), which is roughly the equivalent of an IMAX film or 16 times the pixel resolution of full HD (1080p).

So, before making your purchase decision, do your homework and then go ahead with the best UHD TV you can afford for yourself. It is worth mentioning that 4K UHD TV prices are coming down.

Design and features

As UHD TVs are manufactured to provide customers with advanced technology with quality features, buyers must check and research their design and features well, before buying one.

Major TV manufacturers attempt to convince customers to buy a UHD 4K TV in order to get a better operating system, voice-controlled remote control, search function and 3D compatibility. These parameters become a strong factor in attracting buyers towards the product.

SOME UHD TVs AVAILABLE IN INDIA

	Vu 48D6455 122	Micromax 50K2330	LG 40UB800T	Samsung HU8500	Philips 58PUT8509	Samsung SUHD UA65JS9000K
						
Price	₹ 45,000	₹ 49,990	₹ 62,235	₹ 159,000	₹ 235,000	₹ 440,900
Features worth looking at	• LED display • 122cm (48-inch) • UHD (4K), 3840 x 2160 pixels • Smart TV • 3 x HDMI, 4 x USB • Ethernet • Refresh rate: 60Hz	• LED display • 124cm (49-inch) • UHD (4K), 3840 x 2160 pixels • Smart TV • 2 x HDMI, 3 x USB • Ethernet • Refresh rate - clear motion rate: 60Hz OC ready	• LED display • 100cm (40-inch) • UHD (4K), 3840 x 2160 pixels • Smart TV • 3 x HDMI, 3 x USB • Built-in Wi-Fi • Ethernet	• LED display • 122cm (48-inch) • UHD (4K), 3840 x 2160 pixels • 3D TV, Smart TV • 4 x HDMI, 3 x USB • Built-in Wi-Fi	• Pixel Plus UHD • Wi-Fi Miracast: Mirrors the smartphone screen to the TV • Multi-room TV • Ultra-slim lines for a refined profile • Ultra-narrow bezel • 400Hz PMR UHD • 3D view	• Flawless motion-handling capabilities • Connect box • Quality sound • Lightning quick settings and smart interface • Powerful 3840×2160 pixels • 60W 4.2 channel front-bottom trigging speakers

The prices mentioned here are from various e-commerce portals and are subject to change.

Take a look at the size of the screen because price depends on it. 4K UHD TVs come with 3D displays using active 3D technology and the picture enhancement technology usually includes Pixel Plus, Digital Natural Motion, Micro Dimming and 400Hz PMR Ultra for improved 4K motion.

Also, look at connectivity options that should include HDMI inputs, component input, USB ports, antenna input, Ethernet port, audio L/R in, digital audio out, headphones out and Wi-Fi.

Remotes play a major role in any TV technology and the best part is that 4K TVs generally come with interesting and advanced technology based remotes; these also carry a smart piece of design that makes the system a lot easier to use. If useful apps are preloaded onto the TV, and you have access to app stores like Google Play Store, then you are good to go.

The picture quality

Advanced UHD dimming technology brings an ideal level of contrast and colour to your UHD viewing. Higher resolution of UHD also means that the picture requires more processing for a highly-detailed image.

Technology used in the making of a UHD TV brings realistic and detailed colours in picture. Picture quality varies between good and satisfactory, depending on the content that is being played. There is a real sense of depth and dimension to a 3D picture. Some manufacturers use active 3D for beautiful 3D pictures but that too depends on the content.

Quality sound matters

From the sound perspective, most 4K UHD TVs come with speakers that produce a loud sound but that is definitely not enough. Performance of sound plays an important role in adding quality to the overall presentation of your UHD TV.

TVs that have 4.2 channel-front bottom-firing speakers with dual woofers for improved bass provide the best sound on a TV. A UHD TV with impressive loud sound producing booming bass could be the right choice for you, so keep your ears open and select a good sound bar or speaker, which can go along with a big-screen TV.

Multi-link screen

A multi-link screen brings the entertainment experience to a whole new level by providing multiple-screen viewing. Users can easily search for information on the Internet about a TV show that they are watching, on the same screen, or watch recommended video clips related to the live show they are watching, simultaneously.

Buyers must be aware of the fact that all features vary depending on the TV model's specifications.

Powerful processor

When it comes to the performance of a TV, the processor marks its entry. It is all about the operation of the processor, which offers enhanced performance. If your UHD TV is powered by a powerful quad-core processor with a decent amount of user-available storage, you will notice the difference straight away. With this, you can switch between content and Web browsing, as well as smoother interaction. Entertainment experience will be so much more enjoyable, with less waiting and more viewing.

Content

All this is fine, but 4K TV content is lacking not only in India but in most countries at present. Yet, 4K TV is becoming the *de facto* standard in the hope that content would become available sooner than later. Videocon D2H and Tata Sky are already offering 4K set-top boxes that enable reception of a channel with 4K content, which at present mostly comprises re-runs of documentaries and some sports events.

The other source of 4K content, of course, is the Internet. But then you will end up using four times the data compared to full-HD, inflating your Internet bill. ●

Nine Cool Features On Google You Did Not Know About

Google Sky screenshot

WWW.EFYTIMES.COM

Search engine giant Google can go beyond its function of being just a search engine for your queries. There are times when Google tends to surprise its users and how! Listed below are nine super-cool features that you might not have known existed on Google.

Calorie comparison

If you have to compare your favourite food item against another, you might as well do that using the search engine. For instance, punching in the name of one food item versus the other will enable Google to dish out details of the two food items including calorie count, nutritional content and a lot more, in a tabular form. We think it is going to be an interesting tussle between pizza and chocolate brownies.

Setting a timer

Keying in any time in the search bar followed by the words 'bar timer' would allow you to get a countdown for the time set. You can also set an alarm, for the time you have set. It is an excellent option for those who need to accomplish a task within a stipulated span of time.

Tip calculator

Budget could be a constraint, especially if you plan to go out on a binge with your friends. To add to your woes, you also need to tip the waiter at a restaurant, apart from paying the allocated bill amount. Tip calculator on Google allows you to calculate the tip you should be paying once you enter the full bill amount. It also tells you how much each individual at the table needs to pay, to fulfil the total billing amount, when you are going Dutch.

Filtering Gmail

Adding '+website' to your Gmail ID will allow you to sign up with several websites, using your Gmail ID. Here is how: your email + *website@gmail.com*. It will also allow you to create a folder, where all emails from that particular website can land in.

Cool fonts

Google Fonts has a huge database of cool fonts that an individual can download and use for free. The user also has the option of making a font as the default font on the browser.

Wedding planner

For all those who did not know about it, Google provides the option known as Wedding Planner for its users. To make sure all goes well on your big day, you could make optimum use of this feature for every little thing that you need to take care of, from announcing the news of your marriage to setting up a shareable photo stream for the big day. If that is not enough, it also saves you the cost of hiring a wedding planner to make your event a successful one.

Google Art Project

Google Art Project allows individuals to view artefacts from more than 600 international galleries, present across the globe. You certainly could not have asked for more.

Explore the universe

The option of Google Sky by Google allows you to delve into the far reaches of the universe. From viewing images on NASA satellites and Hubble Telescope, you can explore the galaxies from the comfort of your room. You could also learn a lot more about astrological signs and listen to space-related podcasts.

Playing with Lego

Revive your days of glory and childhood on *buildwithchrome.com*. Check out some cool constructions by other users and master the art of brick layering on this tool. In addition, with its inbuilt map function, the website allows you to share your Lego constructions with people all over the world. Lego on Google is so much fun, for you will never end up stepping on these. ●

GEIST
geistglobal.com

GEIST MONITOR | Watchdog

Sahasra Electronics Pvt. Ltd.

Monitor:

Environmental factors like heat, humidity and moisture pose a severe threat to your mission-critical infrastructure.

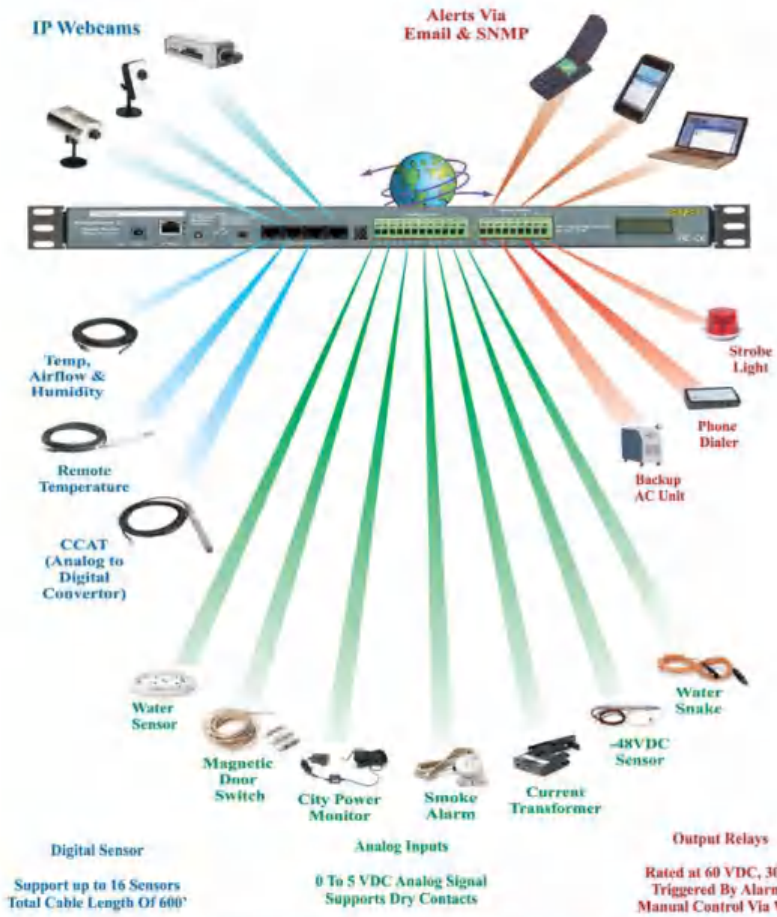
These dangers can be minimized by incorporating a network of Geist sensors to collect data and alert users to potential threats.

Geist's line of monitoring products allows users to observe conditions from a secure Web interface and receive SNMP, email, text message or voice call alert notifications when environmental sensors detect a problem.

The Web interface can display live video surveillance and environmental measurements including temperature, humidity, airflow, light, sound, power and water detection.

Measurements are logged to track trends. Units equipped with dry-contact relay outputs can be used to trigger external devices, either automatically via programmed alarm thresholds or manually via the Web interface.

Web-Enabled Climate & Power Monitoring



Watchdog 15 P

The Watchdog 15 P allows users to keep an eye on remote conditions from a secure Web interface

Watchdog 1400 P

The Watchdog 1400 P comes equipped with four digital and six analog sensor ports, LCD display with scrolling measurements, built-in audible alarm and three relay output ports.

Watchdog 100 P

The Watchdog 100 P is a self-contained unit with built-in POE and on-board temperature and humidity/dew-point sensors

GTHD

The GTHD digital sensor collects and transmits real-time temperature, humidity and dew point data to protect critical data center equipment from heat and moisture.

OFFICIAL & ONLY DISTRIBUTOR OF GEIST'S MONITORING PRODUCTS IN INDIA, FOR MORE INFORMATION CONTACT US:

SAHASRA ELECTRONICS (A SAHASRA GROUP COMPANY)
Plot No. 129 – G, NOIDA SPECIAL ECONOMIC ZONE (NSEZ) NOIDA – II, Uttar Pradesh – 201305, INDIA
Tel- 0120 2462782 / 2462783, Fax – 0120 2563119

Email: contact@sahasraelectronics.com | Web: www.sahasraelectronics.com

ADVERTISERS' PRODUCT CATEGORY INDEX

EFY Magazine Attractions During 2015

MONTH	TECHNOLOGY FOCUS	MARKET SURVEYS	BUYER'S GUIDE FOR ELECTRONICS LABS
January	IoT & Big Data	LED Lighting	Programmable Power Supplies
February	3D Printing	Coil Wound Components	Handheld T&M Equipment for Field Engineers
March	Wearables (Smart Humans)	SMT Manufacturing Equipment	Digital Multimeters
April	3G, 4G & Beyond: Latest in Telecom	Industrial Inverters & UPSes for Corporate	FPGA Based Development Boards
May	Virtual Electronics (on Web)	Telecom & Electronics	3D Printers (Under ₹ 100,000)
June	Printed and Flexible Electronics	Educational & Training Products	Wi-Fi & RF Modules
July	Smartcars	Automotive Electronics	Budget-Friendly Oscilloscopes
August	Smarthomes	PCB Industry in India: Suppliers & Manufacturers	Development Boards (Microcontroller based)
September	Medical Electronics	Aerospace & Defence Electronics	Soldering/Desoldering Stations
October	Robotics & Automation (Smart Machines)	Solar Electronics	Latest Tools to Manage ESD for Your Lab
November	Renewable Energy	Industrial Automation	Desktop PCB Manufacturing Equipment
December	Smart Lighting	LCD Display Components	Programmable Power Source

ADVERTISERS' INDEX

Realizing Professional Functionalities with an Entry-Level Pricing

GDS-1000B Series 100/70/50 MHz Digital Storage Oscilloscope

The brand new GDS-1000B series digital storage oscilloscope, with three bandwidth selections - 100 MHz, 70 MHz, 50MHz, and analog signal input terminals by four or two channels(50MHz only equipped with 4 channels), provides entry-level users with more diversified selections. The powerful functionalities of the series augment this economical oscilloscope with more versatile traits that allow entry-level users to sumptuously enjoy the fun and value brought by the test and measurement, which is exactly GW Instek's emerging mission in the test and measurement industry.

- 100/70/50 MHz Bandwidth Selections, 2ch or 4ch Input
- 1GSa/s Maximum Sampling Rate
- 10M Maximum Memory Depth For Each Channel
- 7" 800 x 480 WVGA LCD Display
- 256 Color Gradient Display Function to Strengthen Waveform Performance
- 1Mpts FFT Frequency Domain Signal Display
- Zero Key Function For Horizontal Time, Vertical Voltage and Triggering
- Compact and Innovative Exterior Design

Waveform update rate of 50,000 waveforms per second reveal most accurate signal variation details

Record length of 10M memory depth Leave no problem undiscovered

For more details, please contact your nearest distributor or you may directly write to India_marketing@goodwill.com.tw

Bangalore & Pune : Integrated Services & Consultancy, +91-9845070872, sales@isc4esaindia.com
Chennai : Vamara Techware, +91 9894388839, sales@vamara.in
Hyderabad : Mohan Marketing Associates, +91-9346004041, sales@mohanmarketing.com
Kolkata : Arihant Trading Company, +91-9830033381, gautamg1966@gmail.com
Mumbai : Automate Process Control, +91-9223508308, automatemumbai@gmail.com
Delhi : Salicon Nano Technology Pvt Ltd, +91-9810575940, info@salicontech.com
Thiruvananthapuram : Innovative Instruments Inc, 0471-2316385, instrument_inc@vsnl.net

GW INSTEK
Simply Reliable

GOOD WILL INSTRUMENT CO., LTD.
www.gwinstek.com

Unrivaled Performance, Flexibility, and Value for Automated Test

NI PXI hardware, combined with NI LabVIEW system design software, delivers increased performance, fexibility, and value. Using this combination of modular hardware and productive software, engineers have dramatically reduced costs, realized faster test execution, improved throughput, and increased scalability. With more than 500 PXI products, over 200 global locations, and 700+ Alliance Partners, NI offers the only complete solution for your ever-changing automated test needs.

LabVIEW helps you program the way you think–graphically–while simplifying your approach with built-in analysis and unmatched hardware integration.

>> Accelerate your productivity at ni.com/automated-test-platform

NI Systems (India) Private Limited
Bangalore: 91 80 41190000 | Delhi: 91 11 42658282
Email: ni.india@ni.com

NATIONAL INSTRUMENTS

RNI No. DELENG/2012/51582

RF Signal Analysis in Your Hands!

New Powerful, Affordable, Portable

RSA306 Series USB Spectrum Analyzer

A full-featured spectrum analyzer priced at ₹ 2,58,000 less than half the price of a conventional unit.

RF Design & Development

Minimize time to market - be right, right away.

Teaching

Teach RF beyond the basics and beyond the lab.

Interference Hunting

Fast interference hunting made easy and inexpensive.

Field Maintenance

Troubleshoot your wireless network in real-time.

The RSA306 USB Spectrum Analyzer delivers full-featured spectrum analysis with 9 kHz to 6.2 GHz frequency coverage at half the cost of a standard solution.

It's compact, weighs just 1.3 pounds, takes little space on your bench, and fits easily in your hand, bag, pocket or tool belt. It runs with the full-featured SignalVu-PC signal analysis software, which is now a free download!

- **Powerful –** Real time analysis capability and 9 kHz to 6.2 GHz frequency coverage
- **Affordable –** Less than half the cost of a conventional unit, plus free SignalVu-PC signal analysis software is included
- **Portable –** USB Spectrum Analyzer ready to connect to a PC with USB 3.0
- **Customizable –** Create custom setups on your PC without worrying about losing your settings

For more information, please call our sales channel partner in the city nearest to you. **Ahmedabad :** Optimized Solutions Pvt. Ltd. (91-79) 30080808 / 26589008; **Bangalore:** Aarjay International (91-80) 43409200, Convergent Technologies (91-80) 23490111 / 179; **Chennai :** Aarjay (91-44) 40509200, Primetech Instruments Pvt. Ltd. (91-44) 24492961; **Andhra Pradesh / Orissa :** Peridot Technologies (91-40) 23405855; **Indore :** Optimized Solutions Pvt. Ltd. (91) 9909979950; **Kerala :** Convergent Technologies (91-471) 2462412 / 386; **Kolkata :** Techno Scientific : (91-33) 32948567; **Mumbai :** Vitronics India (91-22) 28506037; **New Delhi :** S.P.I. Engineers Pvt. Ltd. (91) 9810157421; Convergent Technologies (91-11) 42481121 / 1131; **Pune :** Cyronics Instruments Pvt. Ltd. (91-20) 24208200; **North East India :** Vishal Vyapar Vikash (91-361) 2540701.

For more details : in.tek.com/spectrum-analyzer/rsa300

Enquires Call : +91-80-30792726 / 30792741 or
Email To : india.mktg@tek.com

www.in.tek.com

Tektronix®